

I-405

CORRIDOR PROGRAM NEPA/SEPA DRAFT EIS

DRAFT FISH AND AQUATIC HABITAT EXPERTISE REPORT

Submitted to:
Washington State Department of Transportation
401 Second Avenue, Suite 300
Seattle, WA 98104-2887

Prepared by:
David Evans and Associates, Inc.
415 - 118th Avenue SE
Bellevue, WA 98005-3518

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I-405 CORRIDOR PROGRAM

Draft Fish and Aquatic Habitat Report

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Draft Fish and Aquatic Habitat Expertise Report

SUMMARY

This discipline report provides an assessment of the impacts on fish and aquatic habitat of four proposed action alternatives and a No Action Alternative for the I-405 Improvements Project. Each alternative consists of numerous individual projects ranging from bridge and road construction to transportation demand management strategies that involve no construction. This analysis is therefore conducted at a general level to assist decision-makers with their comparison of alternatives for potential impact to the environment. For any alternative selected, substantially more detailed environmental analysis, documentation, and review would be performed in the course of permitting each of the individual proposed projects.

The study area includes portions of the Cedar River/Lake Washington and Green/Duwamish watersheds, and is further subdivided into nineteen sub-basins. These waters support numerous native and exotic fish species, including substantial stocks of chinook, coho, and sockeye salmon. Puget Sound chinook salmon and bull trout are present in the study area and are currently listed under the federal Endangered Species Act (ESA). Bull trout use of the project area is limited largely to migration through it. Puget Sound/Strait of Georgia coho salmon are a "candidate" species. Nearly the entire study area has been designated by the National Marine Fisheries Service (NMFS) as critical habitat for Puget Sound chinook salmon. However, nearly the entire study area has a long history of drainage alteration, and already displays highly urbanized watershed conditions. Severe degradation of aquatic habitat and declines in native salmonid populations have been documented throughout the study area.

Impact assessment for this report is based on comparing among alternatives the number of stream crossings, number of specific locations where construction is proposed within 300 feet of streams, and the amount of new impervious surface. Impacts were assessed by basin in order to allow for consideration of varying existing conditions and the distribution of proposed projects in the study area. Table S-1 summarizes the impact assessment results.

Table S.1: Summary of Potential Impacts and Possible Mitigation Measures

Summary of Findings		
Element	Environmental Consequences	Summary of Mitigation
Fish and Aquatic Habitat		
No Action Alternative	The No Action Alternative does not reflect existing conditions, but rather it includes potential impacts of I-405 corridor transportation projects which are already committed. Therefore, the No Action Alternative would result in 163.6 acres of new impervious surface.	
Alternative 1	<p>169 riparian encroachments would occur in Alternative 1, substantially fewer riparian encroachments than other action alternatives. This indicates substantially less potential for direct construction impacts to fish habitats and populations.</p> <p>Alternative one would create 304.8 acres of new impervious surface, or only about half as much new impervious surface as any other action alternative. No substantial effects on hydrology or water quality are expected under this alternative. It has the least new impervious for every basin except Kelsey, West Lake Sammamish, and Soos Creek basins. Overall, Alternative 1 has the least potential impact on fish populations and habitats, including threatened species of any action alternative.</p>	<ul style="list-style-type: none"> • A number of BMPs (e.g. installing mulching, hydroseeding, matting, filter fences and other erosion control measures) during construction to reduce the potential for adverse stream impacts. BMPs would be dictated by WDFW for work in streams or other water bodies. • Limit clearing and grading to the typical dry season • Provide current standard for retention/treatment of stormwater and water quality treatment. • All equipment be maintained and refueled on impervious surfaces where potential spills and storm-water runoff can be contained. Prepare toxic spill response plan. • Address avoidance in the design of specific projects. • Minimize in-stream structures or activity as well as disturbance of riparian vegetation. • Compensatory mitigation locations and concepts will be identified during the permitting for specific projects. <p>WSDOT will continue coordination with state and local agencies, concerning any compensatory habitat mitigation that may be required for specific projects. The objective would be to focus on I-405 mitigation efforts most effectively within each impacted basin.</p>
Alternative 2	Alternative 2 would result in 299 encroachments, the highest of any alternative in 12 of the 19 basins. This reflects the highest potential for construction impacts of all the action alternatives. Alternative 2 could have substantial impacts on hydrology and water quality in several study area basins and would create the most new impervious surface for several individual basins, including Bear Creek basin, which retains some of the most intact fish populations and habitat in the study area.	Same mitigation as Alternative 1.
Alternative 3	Alternative 3 would produce 209 riparian encroachments, the highest number of crossings of all alternatives in the Lower Cedar River and Soos Creek (equal to Alternatives 1 and 2) and would create 600 acres of new impervious surface, equal to or most of any alternative in 5 of the 19 basins.	Same mitigation as Alternative 1.
Alternative 4	Alternative 4 would cause 229 new riparian encroachments, the highest of any alternative for 4 of 19 basins. Alternative 4 would result in 888.3 acres of new impervious surface, the greatest amount in 7 of the 19 basins and has the highest potential for operational direct impacts. It would create substantially more new impervious cover than other action. In addition, Alternative 4 includes the only proposed activity outside the UGA, in the Sammamish River basin.	Same mitigation as Alternative 1.

1. INTRODUCTION

1.1 Report Organization and Scope

This report presents an evaluation of the potential impacts of five alternative approaches to traffic and transportation-related improvements in the Interstate 405 (I-405) corridor on fish habitats and populations, including federally listed and proposed listed fish species.

1.2 Overview of I-405 Corridor Program

Construction of the 30-mile Interstate 405 (I-405) freeway in the early 1960s as a bypass around Seattle for Interstate 5 (I-5) traffic also opened the rural, agricultural countryside east of Lake Washington to commercial and residential development. Interstate 405 currently ranges from six to ten lanes along the 30-mile corridor, and it is the designated military route through Seattle, as Interstate 5 was deemed too constricted (see Figure 1.1). Construction of the Evergreen Point (SR 520) floating bridge in 1963 further set the stage for rapid and substantial changes on the Eastside.

Today, I-405 has changed dramatically from a Seattle bypass to become the region's dominant north-south travel corridor east of I-5. More than two-thirds of the total trips on I-405 begin and end in the corridor itself. The remaining third have strong ties with the communities along SR 167 to the south of the study area, and with developing areas to the east within the urban growth area of King County. However, as the regional importance of the I-405 corridor has grown, it has become increasingly evident that worsening traffic congestion within the corridor has the potential to create serious adverse effects on personal and freight mobility, the environment, the state and regional economy, and the quality of life.

In response to these and other concerns, the Washington State Department of Transportation (WSDOT) has joined with the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Central Puget Sound Regional Transit Authority (Sound Transit), King County, and local governments to develop strategies to reduce traffic congestion and improve mobility in the I-405 corridor from Tukwila in the south to Lynnwood in the north.

The I-405 Corridor Program is a cooperative effort involving over 30 agencies that have responsibilities for planning, regulating, and implementing transportation improvements in the 250+ square-mile corridor. The decision to be made through the combined National Environmental Policy Act/State Environmental Policy Act EIS process is to identify the best mix of modal solutions, transportation investments, and demand management to improve movement of people and goods throughout the I-405 corridor, reduce foreseeable traffic congestion, and satisfy the overall program purpose and need.

The programmatic I-405 Corridor Program EIS focuses on broad corridor-wide issues related to travel mode and transportation system performance. This is consistent with the program objective to enable program decisions focusing on mode choice, corridor selection, general location of improvements, and how combinations of improvements may function

together as a system to solve corridor-wide transportation problems. A programmatic level of analysis is appropriate and necessary at this early stage in the decision-making process, when many project-level design details would not be meaningful in evaluating effects on mobility and environmental quality across such a large area. Subsequent environmental analysis, documentation, and review will be prepared to enable decisions regarding site-specific, project-level details on alignments, high-capacity transit technology, project impacts, costs, and mitigation measures after a preferred alternative has been identified.

1.3 Need For the Proposed Action

The need identified for the I-405 Corridor Program is:

To improve personal and freight mobility and reduce foreseeable traffic congestion in the corridor that encompasses the I-405 study area from Tukwila to Lynnwood in a manner that is safe, reliable, and cost-effective.

The following sub-sections expand upon the issues and trends that influence the need for the proposed action, particularly with respect to travel demand and traffic congestion, and the attendant effects on freight mobility and safety.

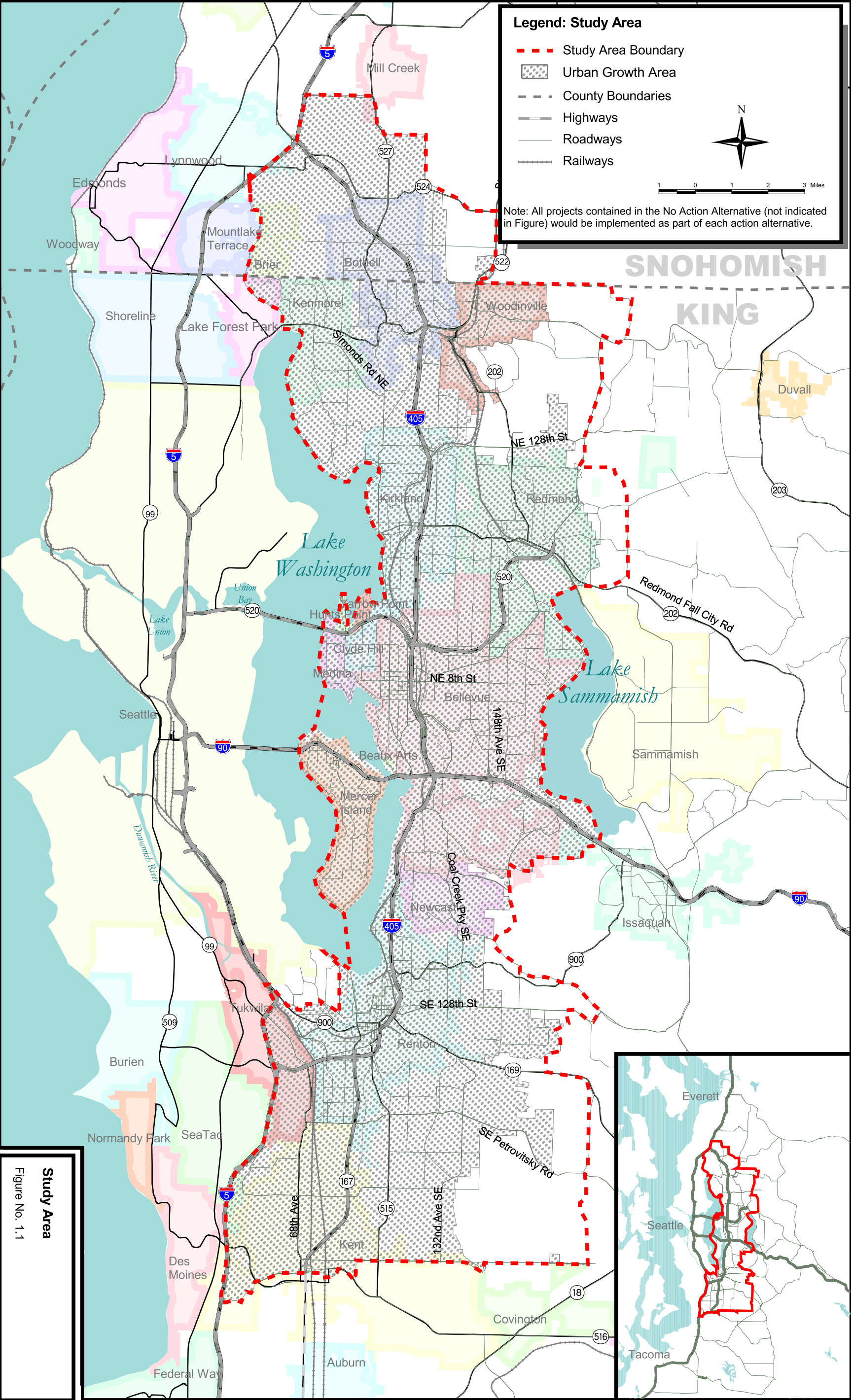
1.3.1 Growth in Travel Demand

Between 1970 and 1990, communities in the I-405 corridor grew much faster than the central Puget Sound region as a whole. During the 20-year period, employment in the study area increased over 240 percent from 94,500 to 323,175 and population grew nearly 80 percent from 285,800 to 508,560.

Population and employment continued to grow during the 1990s; in particular, employment grew at an annual rate of almost 3.5 percent. Looking ahead, growth in the corridor through 2020 likely would keep pace with the robust rate of growth in the Puget Sound region. The I-405 corridor population and employment is forecast to increase by more than 35 percent. This means that by 2020 an additional 144,000 people are expected to be employed within the study area, while the population is expected to reach approximately 765,000, an increase of more than 200,000 people from 1997.

1.3.1.1 Travel Demand

Travel demand trends in the I-405 corridor match these population and employment trends: between 1995 and 2020, person-trips are generally expected to increase more than 50 percent. Travel demand in terms of traffic volume is heaviest within the study area on I-405 itself, with the freeway carrying 60 to 70 percent of the total daily traffic volumes passing through the study area in the north-south direction. Conversely, the arterial streets carried 30 to 40 percent. In the east-west direction, the arterial street system plays an important role, with volumes almost equally distributed between the arterial streets and the two east-west freeways, I-90 and SR 520. In 1999, the highest volumes on I-405 occurred in the vicinity of NE 8th Street in Bellevue: about 210,000 vehicles per day. I-405 at SR 900 in Renton typified traffic volumes on I-405 south of I-90, carrying about 138,000 vehicles per day.



Legend: Study Area

- Study Area Boundary
- Urban Growth Area
- County Boundaries
- Highways
- Roadways
- Railways



1 0 1 2 3 Miles

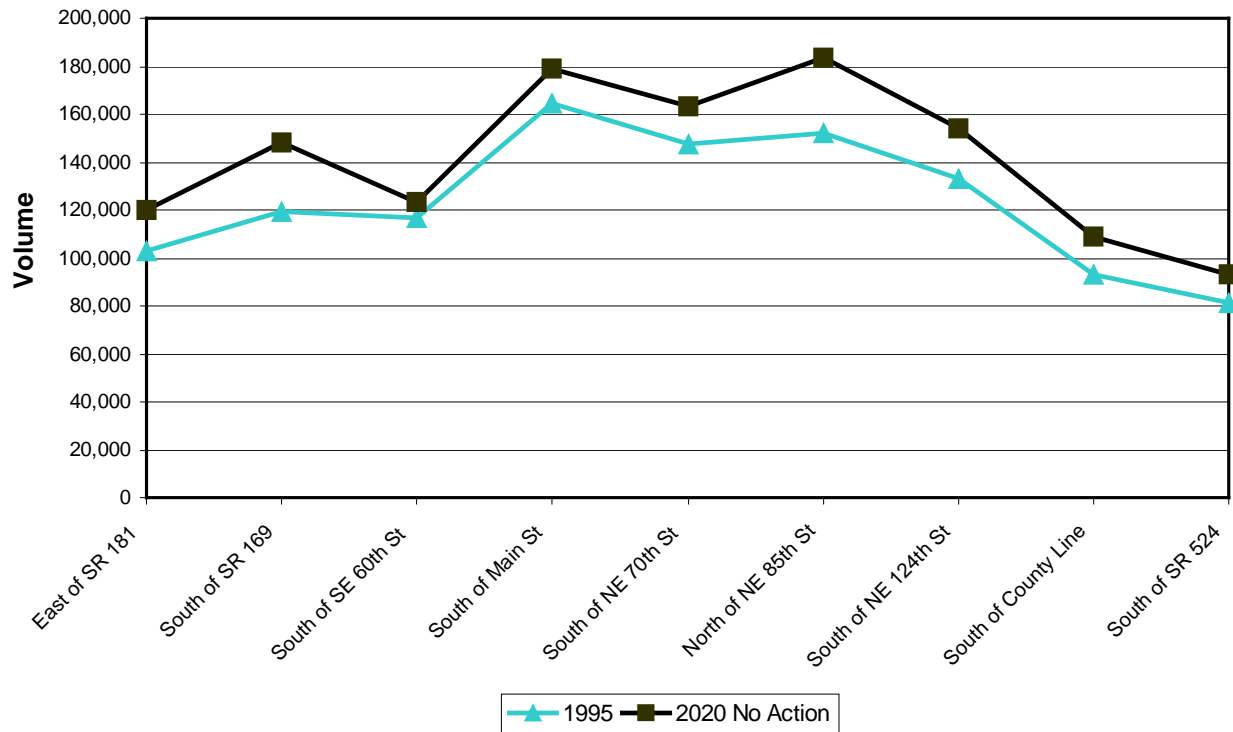
Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

Study Area
Figure No. 1.1

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WSDOT's most recent traffic count data (1999) show the lowest I-405 traffic volumes, 95,000 vehicles per day, in the north end between SR 522 and I-5 at Swamp Creek, and the highest, 210,000 vehicles per day, between I-90 and SR 520. The section south of Kirkland to SR 520 carries 185,000 to 195,000 vehicles per day, and the section south of I-90 typically carries 150,000 vehicles per day. Figure 1.2 shows these findings. This variation in traffic volumes is the result of different travel demands within the corridor as well as the available capacity on the freeway.

Figure 1.2: Daily Traffic Volumes at Selected Locations on I-405



Source: PSRC Model

1.3.1.2 Mode Split

Single-occupant vehicles (SOVs) generate the majority of traffic demand: up to 78 percent of work trips within the I-405 study area are SOVs. High-occupancy vehicles (HOVs) and transit users comprise around 20 percent of all work trips within the study area. SOV use in the study area is higher than the average for King County, while HOV and walk/bike percentages are lower. These results reflect the more suburban character of the I-405 study area.

The segment of I-405 with the highest peak-period transit ridership is between SR 520 and the Totem Lake area (2,100 riders). Transit ridership near each of the northern and southern termini of I-405 is less than 1,000 riders during peak periods. To encourage more transit demand, Sound Transit's Regional Express program is currently in the planning and early design stages of new park-and-ride lots, transit centers, and direct access ramps, including

large-scale improvements to several I-405 interchanges. King County Metro and Sound Transit's evolving bus transit services concept for the I-405 study area would serve multiple activity centers, instead of the traditional Seattle/Bellevue hub-and-spoke design.

1.3.1.3 Trip Characteristics

Travel demand on I-405 appears greater for longer trips; along several sections of I-405, the average vehicle trip length exceeds 25 miles, roughly three times the study area average. Forecasts for 2020 show the freeway attracting even more long trips, with over 50 percent of all trips on I-405 exceeding 30 miles in length.

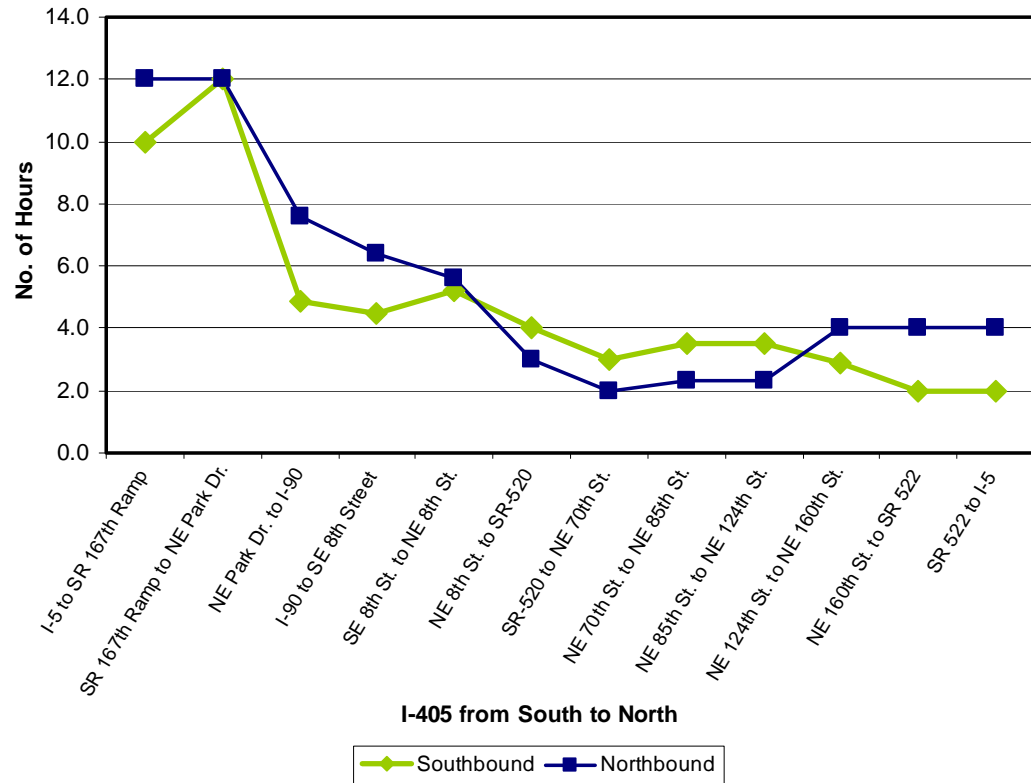
Today in the study area, only 20 percent of the total daily person-trips are home-based work trips, that is, commute trips directly to and from work. Thirty-nine percent of daily person-trips are other home-based trips (e.g., shopping, recreational, personal business) and 28 percent are non-home-based trips (e.g., traveling from work to daycare or shopping). School (2 percent) and commercial vehicle trips (11 percent) make up the rest. The relative shares of each trip purpose are expected to be similar in 2020. The fairly small share of trips that are purely to and from work reflects the fact that people are increasingly linking their trips, stopping on the way home to shop, pick up children, etc. (which are considered non-home based trips). This poses a challenge for transit and carpool/vanpool use.

1.3.2 Traffic Congestion and Reliability

1.3.2.1 Traffic Congestion

Heavy travel demand and frequent traffic incidents contribute to substantial traffic congestion on I-405, although they are not the only causes. Traffic congestion along I-405 is widespread during the morning and afternoon peak periods and has spread to surrounding time periods. A useful way to examine daily congestion is to look at the number of hours during which a facility is congested. For purposes of this analysis, "congestion" on the freeway is defined as travel speeds below 45 mph. Figure 1.3 illustrates the severity of traffic congestion that was present in 1997 at twelve points along I-405. The duration of traffic congestion in the northbound and southbound directions is roughly the same. The most congested area of I-405 is from I-5 in Tukwila to NE Park Drive in the city of Renton. Traffic congestion for 10-12 hours per day is typical in this section. For most other sections, traffic congestion lasts 2 to 7 hours per day.

Figure 1.3: Hours of Traffic Congestion on I-405



Source: PSRC Model, Mirai Associates

The average daily “volume per freeway lane” is quite consistent throughout the corridor, which demonstrates that traffic volumes alone do not cause congestion. The most likely reason for the high hours of congestion in the south end of I-405 relates to freeway “friction” caused by curves (e.g., the “S-Curves”), grades (e.g., Kennydale Hill), and complex interchanges at I-5 and SR 167.

Traffic congestion on I-405 often results in blockage of mainline flows throughout the day by vehicles that cannot get onto the ramps at such locations as SR 167, I-90, SR 520, and SR 522. The spill-over traffic from the ramps has created substantial mainline traffic congestion and operational hazards throughout the I-405 corridor. This congestion also causes traffic to back up onto local arterials.

1.3.2.2 Travel Time

Variation in congestion causes travel times to vary widely within the I-405 study area, depending upon the origin and destination of the trip and the mode of travel being used. Table 1.1 summarizes typical P.M. peak-hour travel times (1995 data) for a variety of study area trips, averaging 23 miles in length. The times are for door-to-door travel, including in-vehicle time and access to the trip’s origin and destination. The fastest trips are typically by non-transit HOV mode, particularly for longer trips along I-405 that can take full advantage of the HOV lane system. Traveling along the full length of I-405 during the peak period can

take longer than one hour for general traffic. Transit travel times are often at least twice as long as driving the equivalent distance, especially for people walking to the transit stops. Transit travel times are 10 to 15 percent faster for park-and-ride access trips compared with walk access transit trips. This is partially due to shorter wait times at park-and-ride locations created by more frequent transit service.

Table 1.1: Comparison of Typical I-405 Study Area P.M. Peak Hour Travel Times by Mode

Trip	Distance (miles)	General Traffic Travel Time (min)	HOV Travel Time (min)	Transit Travel Time Walk Access (min)	Transit Travel Time Park-and-Ride Access (min)
Bellevue Central Business District (CBD) to Federal Way/Kent	25	56	40	95	83
Renton to Mill Creek	33	65	49	125	105
Bellevue CBD to Edmonds/Lynnwood	19	42	38	85	76
Tukwila/SeaTac to Redmond/Overlake	23	49	39	116	103
Issaquah/Cougar Mt. to Bothell/Kenmore	23	46	39	108	98
Issaquah/Cougar Mt. to Federal Way/Kent	23	56	47	132	118

Source: Puget Sound Regional Council (PSRC) Model - 1995 base year

1.3.2.3 Travel Time Reliability

Not only do travel times vary by segment within the I-405 study area, they are unpredictable from day to day. The reliability of travel times can be defined in terms of deviation from a mean travel time when travelers in the same transportation mode repeat their trips with identical travel routes starting at a same time of day. A transportation system provides a good level of service when travelers experience the same travel time every time or with little deviation.

The Washington State Transportation Center (TRAC) conducted research to measure the performance of the freeway system in the Central Puget Sound area, which includes the travel time reliability measure for general traffic along I-405. The most recent analysis results are described in the report entitled Central Puget Sound Freeway Network Usage and Performance, 1999 Update, Volume 1 (Washington State Transportation Center and Washington State Department of Transportation). The following summarizes the findings of the travel time reliability data prepared by the TRAC for 1999.

- > Existing travel time reliability for the vehicles traveling *from Tukwila to Bellevue CBD* is very poor during the mid-day and evening periods and extremely poor during the morning peak period.
- > Existing travel time reliability for the vehicles traveling *from Bellevue CBD to Tukwila* is poor throughout the day (from 6:00 A.M. to 6:30 P.M.). In particular, the travel time reliability during the afternoon peak period is very poor and the traffic flows in the period are highly unstable.
- > Existing travel time reliability for the trips *from Bellevue CBD to SR 522* is relatively poor during the P.M. peak period. Travelers starting trips during other periods have experienced good travel time reliability.

- Existing travel time reliability problems for the trips *from SR 522 to Bellevue CBD* are confined to the A.M. peak period. The problem is worst at 8 A.M.

Traffic incidents along the freeway corridor are major causes of the reliability problems. The State's Incident Management Program was implemented to help improve overall travel time reliability within the I-405 Corridor. Reliability of travel in the HOV lanes is considerably better than in the general purpose lanes. HOV travel times typically operate from 15 to 20 miles per hour faster than the adjacent general purpose lanes during congested time periods. HOV travel time reliability suffers when there is a major incident along I-405 with stop-and-go conditions. In these situations, HOV speeds drop and the level of HOV lane violations tends to increase.

1.3.3 Freight Mobility

The decreasing reliability of the regional transportation system, including I-405, is creating a serious problem for regional freight mobility. The central Puget Sound region serves as an important freight gateway to Pacific Rim countries. Automobiles, forest and agricultural products, communications and computer equipment, and hundreds of other items continuously move over the region's roadways and railroads, to seaports and airports. Substantial delay as a result of transportation system congestion is costing the region's businesses nearly \$700 million a year, according to information from WSDOT. The cost to the freight industry itself is estimated to be around \$200 million per year.

Products shipped by truck across I-90 from Eastern Washington reach points north and south of Seattle via I-405. At the same time, I-405 serves as a heavily used transport corridor for local freight delivery to and from the cities along the corridor. Smaller trucks, such as delivery vans, account for many freight trips within the region, and these trips could benefit greatly from roadway improvements to I-405.

Interstate 405 continues to be used by freight carriers as an alternative to the preferred I-5 route when severe congestion occurs on I-5 in downtown Seattle near the Convention Center (one of the most substantial freight mobility bottlenecks in the region). I-405 also provides ready access to the distribution centers along SR 167 in the Kent Valley. Volumes of heavy trucks on the portion of I-405 south of I-90 are about double those along the northern portion due to truck movements to and from the Kent Valley. Truckers identify congestion at the SR 167/I-405 interchange as one of the worst transportation system problems in the region, and the trucking community supports improvements to this major truck corridor interchange as one of its top priorities.

The latest data indicate that the central Puget Sound region's roadways carry approximately 1.2 million truck trips each day, with about 70 percent of those trips occurring within King County. I-405 carries a substantial portion of those trips, moving up to 90 percent of the total truck origins and destinations in east King County. Truck volumes along I-405 are expected to grow by 50 percent by the year 2010. Reductions in system reliability and resulting higher transportation costs increase the cost of manufacturing and distributing goods, while adversely affecting economic vitality and job creation. Accessibility to markets becomes increasingly difficult with worsening traffic congestion and delay. Improvements to the I-405 corridor could provide tangible economic benefits for all of Washington State.

1.3.4 Safety

Twenty-nine of the 280 high accident locations in King and Snohomish counties are located along I-405. Most high accident locations are associated with ramps connecting to I-405, including those at SR 181 (Interurban), SR 169, SR 900 (Sunset and Park), Coal Creek Parkway, SE 8th Street, NE 4th Street, NE 8th Street, SR 908 (NE 85th Street), NE 116th Street, NE 160th Street, and SR 527. The portion of I-405 north of SR 527 is identified as a high accident corridor due to the relatively higher speeds and more serious injuries associated with these accidents.

Over the three-year period from 1994 to 1996, a total of 5,580 accidents was reported along I-405. Most collisions occurred on the mainline freeway, with about one-fourth of all accidents occurring on the ramps, collector-distributor roads, and cross streets at the interchanges. About half of all collisions involve property damage only, while half involve injuries or fatalities. This injury pattern applies equally to the mainline and ramp segments; however, all seven fatalities reported in this period occurred on the I-405 mainline.

The overall accident rate along I-405 (1.6 accidents per million vehicle miles) is about midrange compared to other freeways in King County. The rates are lower than the average rate for all state highways (1.88 accidents per million vehicle miles, or MVM) and for state highways in King County (2.27 accidents per MVM). On comparable local freeways, I-5 and SR 520 both exhibit accident rates of about 2.0 accidents per MVM. WSDOT's ramp metering program on I-405 has been very successful. Rear-end and sideswipe accidents have decreased by 60 percent to 70 percent near locations with ramp meters.

For state roads serving as surface arterial routes, accident rates typically fall into the range of three to five accidents per MVM. This rate is related to the presence of traffic signals, driveways, pedestrians, and bicyclists, and lower levels of access control. These accident rates are typical of urban arterial facilities. Accident rates for selected arterial and collector routes in the primary study area generally range between two and four accidents per MVM, with some streets higher. These streets also experience higher accident rates due to the presence of signalized intersections, driveways, and other conflicts.

1.4 Purpose of the Proposed Action

The purpose of the proposed action is:

To provide an efficient, integrated, and multi-modal system of transportation solutions within the corridor that meets the need in a manner that:

- Provides for maintenance or enhancement of livability for communities within the corridor;
- Provides for maintenance or improvement of air quality, protection or enhancement of fish-bearing streams, and regional environmental values such as continued integrity of the natural environment;
- Supports a vigorous state and regional economy by responding to existing and future travel needs; and
- Accommodates planned regional growth.



1.5 Study Area

The study area for the I-405 Corridor Program defines the general boundaries of the I-405 corridor and encompasses the essential improvements proposed within each alternative. It encompasses an area of approximately 250 square miles that extends on both sides of I-405 between its southern intersection with I-5 in the city of Tukwila and its northern intersection with I-5 in Snohomish County. This area includes the cities of Tukwila, Renton, Newcastle, Bellevue, Redmond, Kirkland, Woodinville, and Bothell, as well as portions of the cities of Issaquah, Kenmore, Kent, Lynnwood, and Mercer Island and adjacent unincorporated areas of King and Snohomish counties.

For purposes of environmental analysis, documentation, and review, potential substantial adverse effects are identified and evaluated wherever they are reasonably likely to occur in the region.

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2. DESCRIPTION OF ALTERNATIVES

Four programmatic action alternatives and a No Action Alternative are evaluated in the Environmental Impact Statement (EIS). Each of the four action alternatives is a combination of multi-modal transportation improvements and other mobility solutions packaged to work together as a system. Each package demonstrates a unique emphasis in response to the purpose and need for the I-405 Corridor Program. The improvements and mobility solutions that comprise each action alternative are assembled from the following major elements:

- Transportation demand management (TDM)
- Regional transportation pricing
- Local transit service (bus and other technologies)
- Bus rapid transit (BRT) operating in improved-access high-occupancy vehicle lanes on I-405, I-90, and SR 520
- Fixed-guideway high-capacity transit (HCT) operating with physical separation from other transportation modes
- Arterial high-occupancy vehicle (HOV) and bus transit priority improvements
- HOV express lanes on I-405 and HOV direct access ramps
- Park-and-ride capacity expansions
- Transit center capacity improvements
- Basic I-405 safety and operational improvements
- I-405 general purpose lanes
- I-405 collector-distributor lanes
- I-405 express lanes
- SR 167 general purpose lanes
- Capacity improvements on freeways connecting to I-405
- Planned arterial improvements
- Capacity improvements on north-south arterials
- Arterial connections to I-405
- Pedestrian and bicycle improvements
- Intelligent transportation system (ITS) improvements
- Truck freight traffic enhancements

These elements are described in greater detail in Appendix A (*I-405 Corridor Program - Major Elements of Alternatives*). Table 2.1 shows the system elements contained in each of the alternatives.

Table 2.1: System Elements Contained in Each Alternative

	No Action Alternative	Alternative 1 HCT/TDM Emphasis	Alternative 2 Mixed Mode with HCT/Transit Emphasis	Alternative 3 Mixed Mode Emphasis	Alternative 4 General Capacity Emphasis
Committed and funded freeway projects	X	X	X	X	X
Committed and funded HOV projects	X	X	X	X	X
Committed and funded arterial projects	X	X	X	X	X
Park-and-ride expansions included in No Action	X	X	X	X	X
Transit center improvements included in No Action	X	X	X	X	X
Transportation Demand Management (TDM)	X	X	X	X	X
Expanded TDM regional congestion pricing strategies		X			
Expand transit service by 100% compared to K. Co. 6-year plan		X	X	X	
Expand transit service by 50% compared to K. Co. 6-year plan					X
Physically separated, fixed-guideway HCT system		X	X		
Bus rapid transit operating in improved access HOV lanes				X	
Arterial HOV priority for transit		X	X	X	
HOV direct access ramps on I-405			X	X	X
Additional park-and-ride capacity expansion		X	X	X	
Additional transit center improvements		X	X	X	
Basic I-405 safety and operational improvements		X	X	X	X
I-405/ SR 167 interchange ramps for all major movements			X	X	X
One added general purpose lane in each direction on I-405			X		X
Two added general purpose lanes in each direction on I-405				X	

Table 2.1: (continued) System Elements Contained in Each Alternative

	<u>No Action Alternative</u>	<u>Alternative 1</u> HCT/TDM Emphasis	<u>Alternative 2</u> Mixed Mode with HCT/Transit Emphasis	<u>Alternative 3</u> Mixed Mode Emphasis	<u>Alternative 4</u> General Capacity Emphasis
Two express lanes added in each direction on I-405 ^a					X
Widen SR 167 by one lane each direction to study area boundary			X	X	X
Improved capacity of freeways connecting to I-405			X	X	X
Planned arterial improvements			X	X	X
Complete missing segments of major arterial connecting routes ^b				X	
Expand capacity on north-south arterials ^b					X
Upgrade arterial connections to I-405 ^b			X	X	X
Pedestrian / bicycle connections and crossings of I-405		X	X	X	X
Intelligent transportation system (ITS) improvements		X	X	X	X
Truck freight traffic enhancements		X	X	X	

^a To be studied as general purpose lanes and as managed high-occupancy/toll (HOT) lanes.

^b With jurisdictional approval.

■ 2.1 No Action Alternative

The No Action Alternative includes the funded highway and transit capital improvement projects of cities, counties, Sound Transit, and WSDOT. These projects are already in the pipeline for implementation within the next six years, and are assumed to occur regardless of the outcome of the I-405 Corridor Program. For this reason, they are referred to collectively as the No Action Alternative.

Under the No Action Alternative, only limited expansion of state highways would occur. No expansion of I-405 is included; however, a new southbound I-405 to southbound SR 167 ramp modification would be constructed. Approximately 15 arterial widening and interchange improvement projects would be implemented within the study area by local agencies. Short-term minor construction necessary for continued operation of the existing transportation facilities would be accomplished, and minor safety improvements would be constructed as required.

It is assumed that Phase I of Sound Transit's regional transit plan would be completed. Approximately 36 HOV direct access projects, arterial HOV improvements, park-and-ride

expansions, and transit center enhancements would be implemented in the study area as part of the No Action Alternative. Bus transit service levels by the 2020 horizon year are based upon the Puget Sound Regional Council (PSRC) Metropolitan Transportation Plan. A 20 percent increase in bus transit service hours above the current King County 6-year plan level is assumed by year 2020. Parking costs are expected to increase due to market forces. Additional urban centers and major employment centers within the study area are also assumed to implement parking charges by 2020.

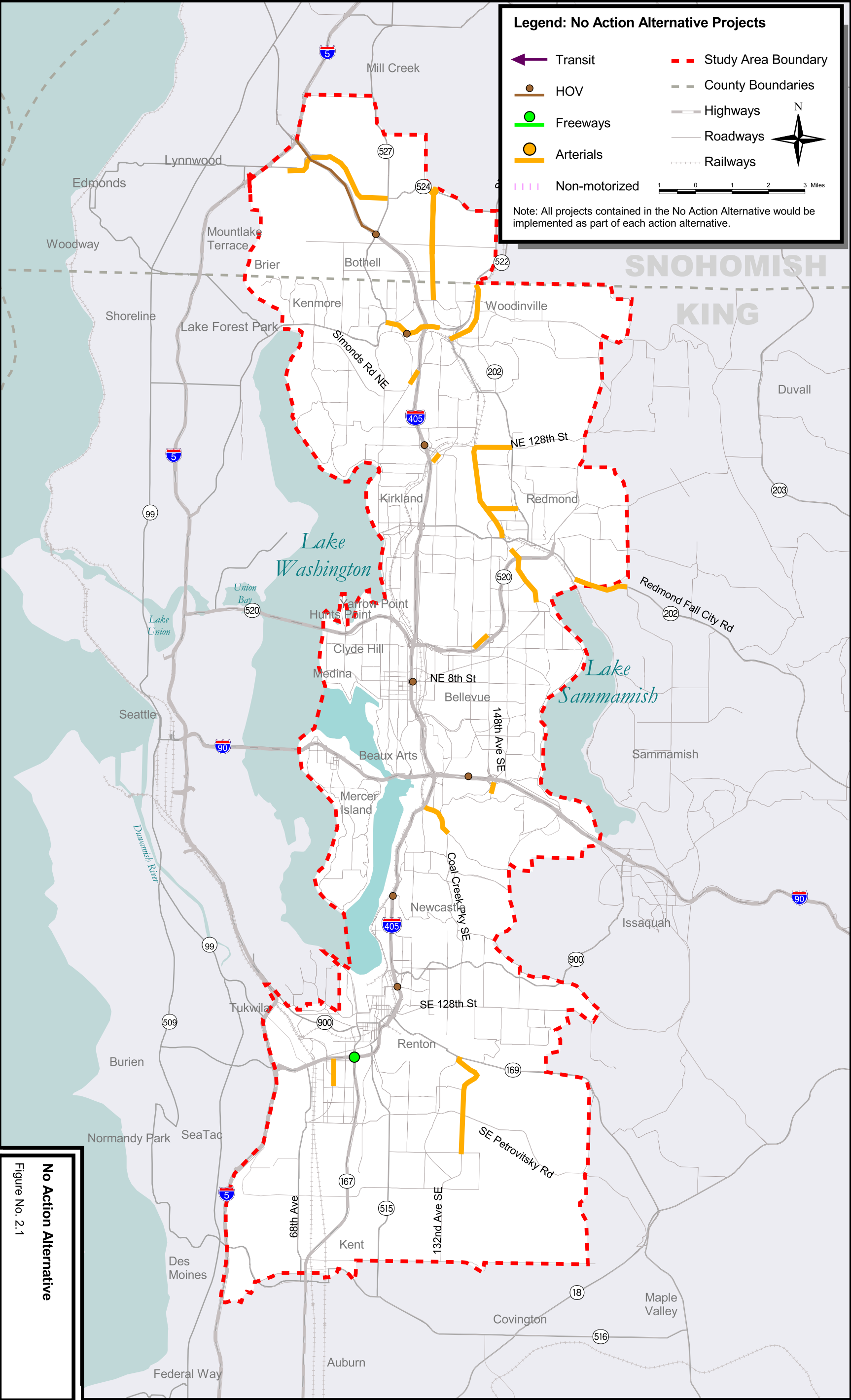
These baseline transportation improvement projects are, or will be, the subject of separate and independent project-specific environmental analysis, documentation, and review. Their direct impacts are not specifically evaluated by the I-405 Corridor Program. However, the secondary and cumulative impacts of these projects are, addressed as part of the analyses contained herein.

Figure 2.1 shows the locations of the improvements contained in the No Action Alternative. Appendix B (Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

2.2 Alternative 1: High-Capacity Transit/TDM Emphasis

This alternative attempts to minimize addition of new impervious surface from general purpose transportation improvements and to encourage transit use within the study area. To do this, Alternative 1 emphasizes reliance on a new physically separated fixed-guideway HCT system, substantial expansion of local bus transit service, non-construction mobility solutions such as regional transportation pricing, and transportation demand management (TDM) strategies. It does not include any increase in roadway capacity beyond the No Action Alternative. All improvements contained in the No Action Alternative are included in Alternative 1, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Alternative 1 includes a physically separated, fixed-guideway HCT system, potentially using some form of rail technology and potentially operating within portions of the existing Burlington Northern Santa Fe (BNSF) right-of-way. The HCT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. (The effects of recent transit reductions on short-term transit service have not been assumed.) Arterial HOV priority for transit, additional park-and-ride capacity, and additional transit center improvements also would be provided.



Legend: No Action Alternative Projects

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

Note: All projects contained in the No Action Alternative would be implemented as part of each action alternative.

No Action Alternative
Figure No. 2.1

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A package of basic improvements to I-405 would be implemented, including climbing lanes, auxiliary lanes, I-90/Coal Creek interchange improvements, and I-405/SR 167 interchange improvements, among others. No additional general purpose lanes on I-405 would be provided.

Limited arterial HOV/transit improvements would be provided to facilitate access to I-405 and the fixed-guideway HCT system, along with non-construction treatments such as providing priority for transit at signals and intersections. Regional pricing strategies similar to those currently being studied by the Puget Sound Regional Council (PSRC) would be implemented along with a package of core TDM strategies that are common to all the action alternatives.

Figure 2.2 shows the location of improvements contained in Alternative 1. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements that are the building blocks for the alternatives. Appendix B (Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.



2.3 Alternative 2: Mixed Mode with High-Capacity Transit/Transit Emphasis

This alternative attempts to improve mobility options in the study area relative to Alternative 1 by providing the same substantial commitment to transit, combined with the minimum increase in roadway capacity for HOV and general purpose traffic. To do this, Alternative 2 would implement a new physically separated, fixed-guideway HCT system, substantial expansion of local bus transit service, one added lane in each direction on I-405, and improvements to connecting arterials. All improvements contained in the No Action Alternative are included in Alternative 2, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Alternative 2 includes a physically separated, fixed-guideway HCT system, potentially using some form of rail technology. The HCT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. Arterial HOV priority for transit, additional park-and-ride capacity, and additional transit center improvements are included, as well as completion of the HOV freeway-to-freeway ramps along I-405.

To increase general purpose capacity, I-405 would be widened by one lane in each direction. One lane also would be added in each direction on SR 167 to the study area boundary. The package of basic improvements to I-405 would be implemented, along with the core TDM strategies that are common to all action alternatives. New capacity improvements on connecting arterials and freeways would be provided along with planned arterial improvements of local jurisdictions.

Figure 2.3 shows the location of improvements contained in Alternative 2. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

2.4 Alternative 3: Mixed Mode Emphasis

This alternative attempts to substantially improve mobility options for all travel modes and to provide a HCT system throughout the study area at a lower cost than the physically separated, fixed-guideway system proposed in Alternatives 1 and 2. To do this, Alternative 3 would implement a new bus rapid transit (BRT) system, substantial expansion of local bus transit service, two added lanes in each direction on I-405, and improvements to arterials within the study area. All improvements contained in the No Action Alternative are included in Alternative 3, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

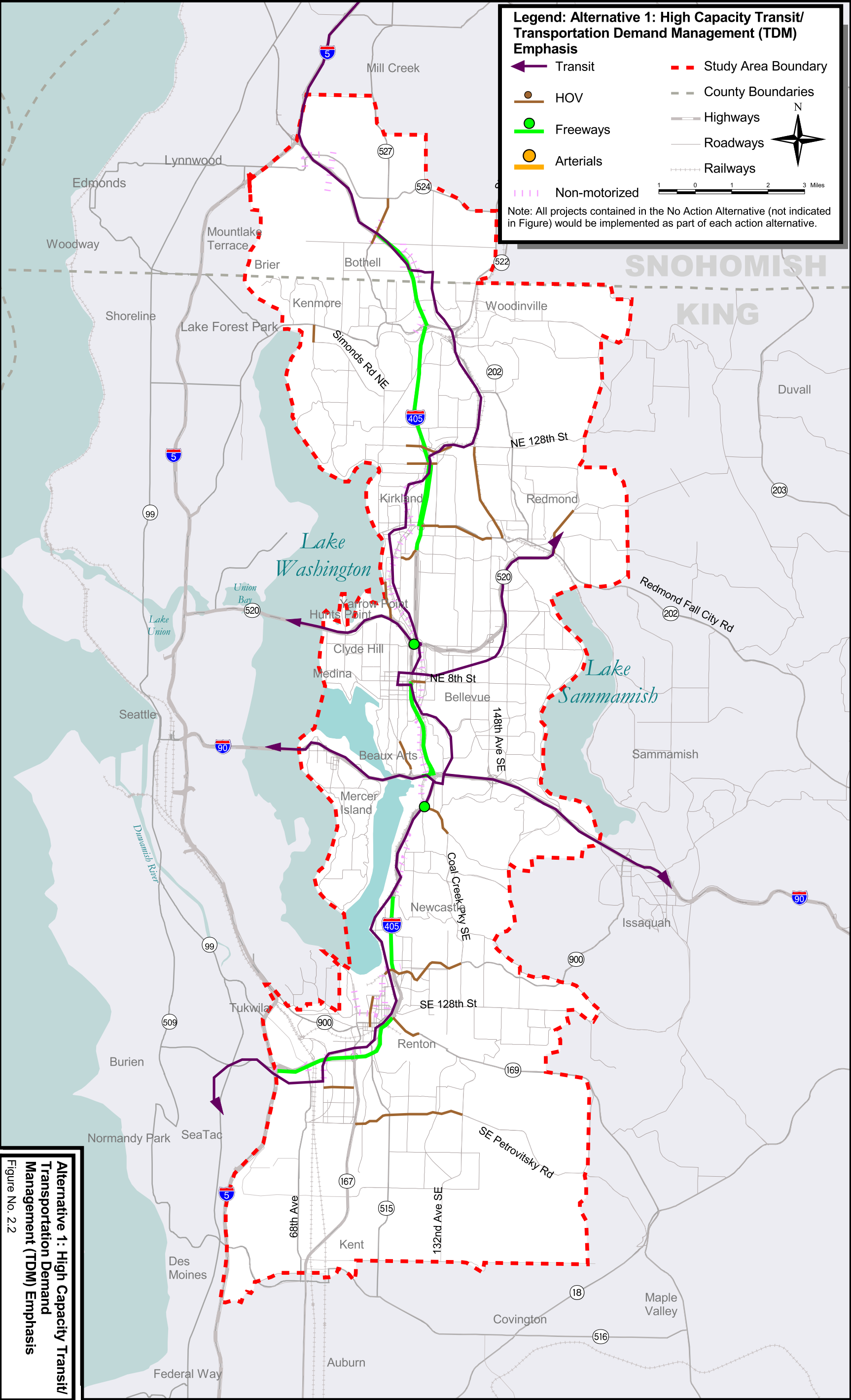
Alternative 3 includes a BRT system operating in improved-access HOV lanes on I-405, I-90, and SR 520. The BRT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. Improved arterial HOV priority for transit, park-and-ride capacity, transit center improvements, and HOV direct access are included, as well as completion of the HOV freeway-to-freeway ramps along I-405.

This alternative would substantially increase capacity for general purpose traffic on I-405 by adding two lanes in each direction and improving major interchanges. These added general purpose lanes replace most of the auxiliary and climbing lanes contained in the package of basic improvements to I-405 that are common to the other action alternatives. One lane would be added in each direction on SR 167 to the study area boundary. The core TDM strategies would be implemented. New capacity improvements on connecting arterials and freeways would be provided. Selected arterial missing links would be completed together with planned arterial improvements of local jurisdictions.

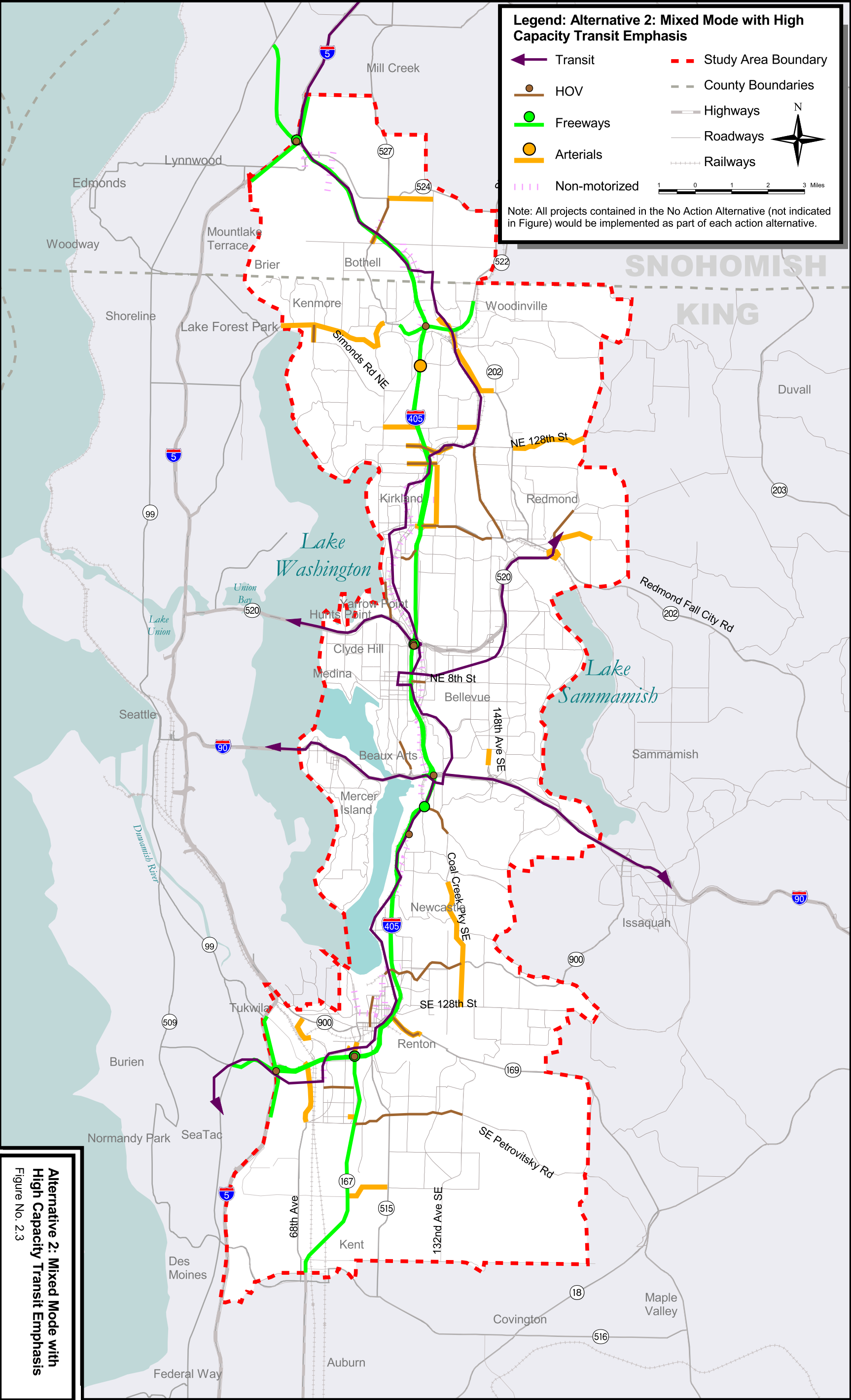
Figure 2.4 shows the location of improvements contained in Alternative 3. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

2.5 Alternative 4: General Capacity Emphasis

This alternative places the greatest emphasis on increasing general purpose and HOV roadway capacity, with substantially less reliance on new transit facilities or added local bus service than any of the other action alternatives. To do this, Alternative 4 would provide one additional lane in each direction on I-405, a new four-lane I-405 express roadway, and the other general purpose and HOV roadway improvements on I-405 and connecting freeways contained in Alternative 3. The expansion of local bus transit service would be about half that proposed under the other action alternatives. All improvements contained in the No Action Alternative are included in Alternative 4, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.



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Legend: Alternative 2: Mixed Mode with High Capacity Transit Emphasis

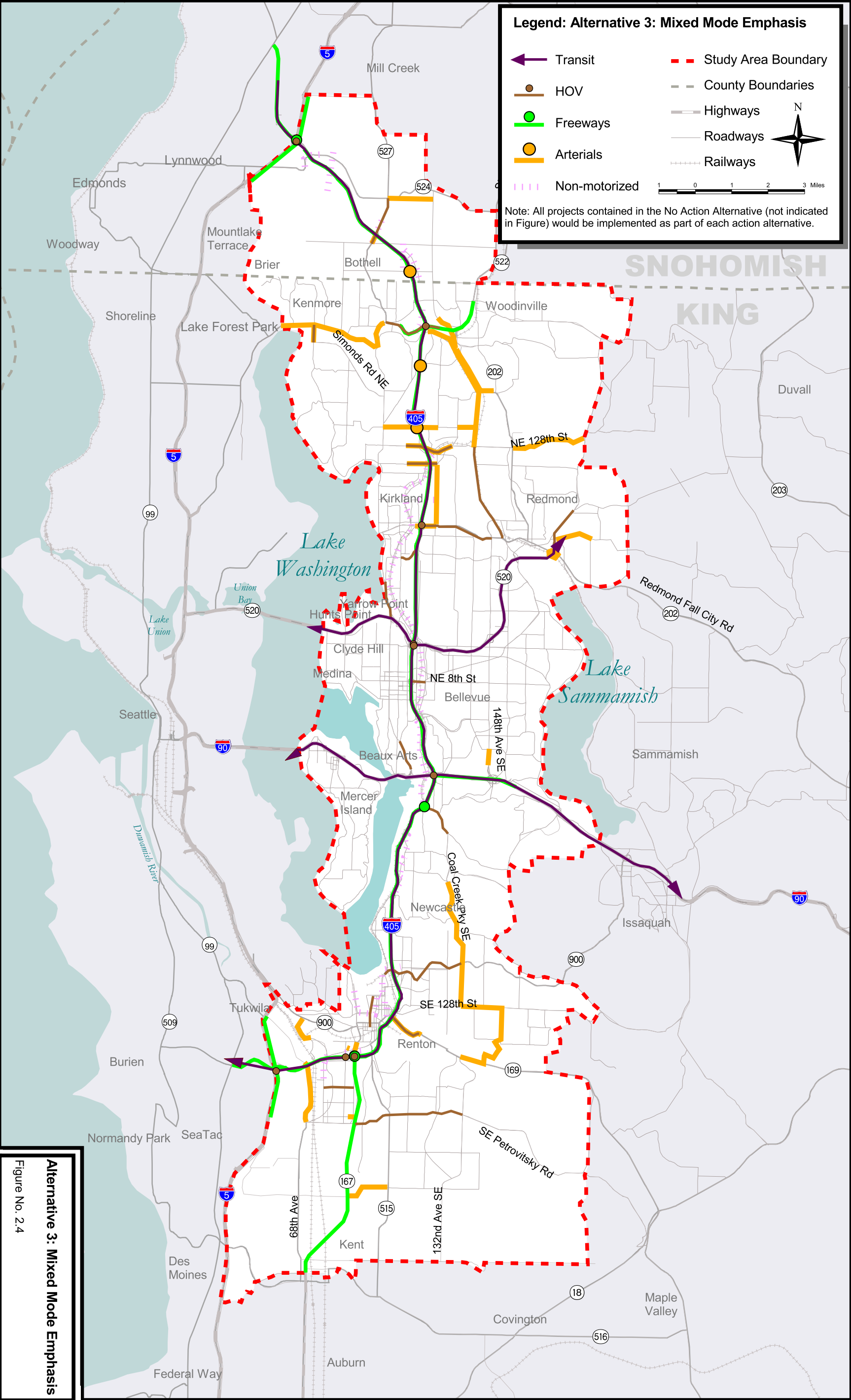
← Transit	--- Study Area Boundary
● HOV	- - - County Boundaries
● Freeways	— Highways
● Arterials	— Roadways
--- Non-motorized	++++ Railways

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

Alternative 2: Mixed Mode with High Capacity Transit Emphasis
Figure No. 2.3

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Alternative 3: Mixed Mode Emphasis
Figure No. 2.4

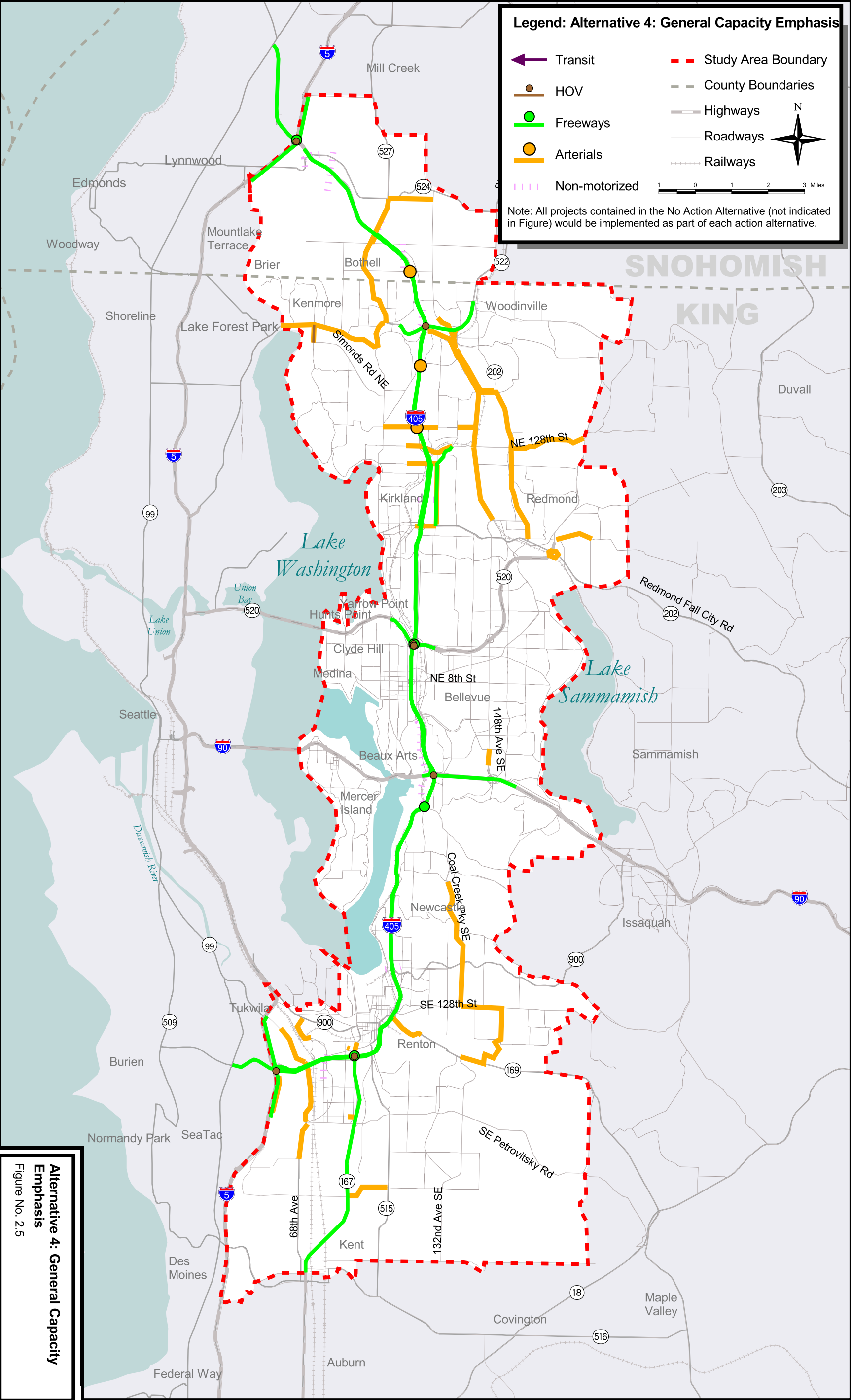
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Alternative 4 would expand freeway capacity by adding one additional general purpose lane in each direction on I-405 in most segments, improving major interchanges, and constructing a new four-lane I-405 express roadway consisting of two lanes in each direction with limited access points. Completion of the HOV freeway-to-freeway ramps along I-405 and the package of basic improvements to I-405 would be implemented.

Arterial improvements would include additional expansion of major arterial routes and connections to I-405 in conjunction with the planned arterial improvements of local jurisdictions. Transit in this alternative is assumed to be a continuation of the existing local and express bus transit system with a 50 percent increase in service compared to the current King County 6-year plan. Park-and-ride capacity would be provided along with the core TDM strategies that are common to all action alternatives.

Figure 2.5 shows the location of improvements contained in Alternative 4. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

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3. METHODS

3.1 Approach to Analysis

This document reports on currently existing fish population and habitat conditions within the study area and assesses potential impacts of the I-405 Corridor Program. All project-area streams regardless of fish presence were included in the analysis based on the best available data sources (King County, 1999).

3.1.1 Baseline Conditions

The baseline conditions description is stratified by basin (King County, 1999) in order to more accurately depict the widely varying watershed conditions, habitat conditions, and fish populations throughout the extensive study area. Baseline fish habitat conditions are described based on numerous published and unpublished references as cited in Section 4.0. Sources include the computer databases and Geographic Information Systems (GIS) of King County, recent assessment reports for Water Resource Inventory Area (WRIA) 8 (Cedar River) and WRIA 9 (Green/Duwamish River), the Washington Department of Fish and Wildlife (WDFW), and a number of basin plans and assessments produced by various cities and counties within the study area.

Existing fish species distribution and habitat conditions have been described using the most recent and comprehensive available sources. These sources were different for various species and watersheds, as cited in Section 4.

In some basins, additional detail on these species was available from local agency documents. Comprehensive, detailed sources for distribution of resident trout and non-salmonid species were not found. Information on presence of these species was obtained where possible from various local agency publications and documents as cited in Section 4. However, developing an updated database of species presence observations was not within the scope of this document.

It is important to note that baseline conditions as defined for this program do not equate to existing conditions. It is assumed that No Action Alternative projects will be constructed regardless of alternatives analysis, and baseline conditions include their impacts.

3.1.2 Impact Assessment

Impact assessment for this report is based on comparing among alternatives the number of stream crossings, number of specific locations where construction is proposed within 300 feet of streams, and the amount of new impervious surface.

Impacts were assessed and mitigation concepts proposed by basin in order to allow for consideration of varying existing conditions and number of proposed projects. For project-wide comparison of alternatives, impact assessment included consideration of varying fish populations and habitat conditions among the various basins. All project-area streams, regardless of fish presence, were included in the analysis based on the best available data sources (King County, 1999; WDFW, 2000).

Detailed, project-level impacts are not addressed in this document because the design of the potential projects has not progressed beyond the preliminary stage. Project-level information not presently available includes the extent of work within stream channels, extent of riparian vegetation disturbance, construction duration and timing, and project-specific disposition of storm-water runoff. After an alternative is selected, this information can be developed to assess the potential impact of each project in detail.

At this level of assessment, these effects can only be generally estimated based on the number of projects that cross or lie near aquatic habitat and the total increase in impervious surface for each alternative.

3.1.3 Mitigation Concepts

Mitigation proposals include primarily generic mitigation such as impact avoidance and best management practices (BMPs). Mitigation proposals are presented conceptually due to the conceptual stage of project design and the broad programmatic scale of this study.

Future coordination will be conducted with local jurisdictions to identify mitigation priorities and existing mitigation projects in each basin. This will allow proposal of specific mitigation sites and concepts to most efficiently address fish habitat limitations in each basin.

3.2 Plans, Policies, and Approvals

3.2.1 Federal Regulations

Under the federal Endangered Species Act (ESA), Puget Sound chinook salmon are listed as “threatened,” bull trout are listed as “threatened,” and Puget Sound/Strait of Georgia coho are “candidate.”

Specific rules implementing the ESA as per Section 4d will take the form of state and local regulations, and will constrain design and construction of individual projects included in the I-405 Corridor Program. National Marine Fisheries Service has published a list of activities covered by regulations that meet ESA standards for species protection, and more activities may be added in the future.

ESA issues will be fully addressed at the project permitting level for each individual project that is ultimately proposed for construction. This will require consultation with federal services for any project potentially affecting listed species. For all projects having a “Federal nexus” such as federal funding or federal permit requirements, a Biological Assessment or Biological Evaluation will be required. The EIS expertise report discusses the baseline distribution, status, and habitat conditions of threatened, endangered, proposed, or candidate fish species sufficiently to serve the purpose of comparing programmatic alternatives. However, it is not intended to anticipate or substitute for these project-specific ESA documents.

Section 404 of the Clean Water Act requires permits for activities within waters of the United States. Individual projects involving such activities will require coordination with the US Army Corps of Engineers.

3.2.2 State and Local Regulations

The Washington State Hydraulic Code requires review and approval by the WDFW of any project activity within or over streams, including discharge of stormwater. King County and Snohomish County, as well as the municipalities in the study area, have ordinances regulating development within critical areas. Each project will have to comply with the specific standards set by these ordinances. Requirements are likely to include production of site-specific baseline studies and detailed impact assessment, establishment of specified buffers, and implementation of mitigation measures. Some local regulations, such as Snohomish County Habitat Management Plan Administrative Rule for Puget Sound chinook salmon, will serve to implement the ESA by establishing rules as per Section 4d of the ESA.

3.2.3 Indian Tribal Treaty Rights

The “Boldt Decision” of 1974 interpreted treaties between the United States and Indian tribes in Washington State. The court determined that Indian tribes have rights to 50 percent of harvestable salmon and have the right to co-manage salmon fisheries with Washington State. The Study Area falls entirely within the “usual and accustomed” fishing area of the Muckleshoot Tribe. The Tribe has a staff of fisheries biologists, operates a salmon hatchery on a Green River tributary, and has taken an active role in managing salmon in this area.

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4. AFFECTED ENVIRONMENT



4.1 Study Area Overview

4.1.1 Watersheds and Drainage Patterns

The I-405 corridor study area lies entirely within two major watersheds. Most of the project lies within the Cedar River/Lake Washington watershed (including Lake Sammamish and the Sammamish River), and a relatively small portion in the southwest corner of the area lies within the Green River watershed (Figure 4.1). Baseline conditions described here include the effects of No Action Alternative projects (Figure 4.2; Table 4.1).

4.1.1.1 Cedar River Watershed

The Cedar River/Lake Washington Watershed (Water Resource Inventory Area [WRIA] 08) includes all streams discharging through Lake Washington and the Lake Washington Ship Canal (including Union Bay, Portage Bay, and Lake Union) to Puget Sound (Figure 4.1). This is one of the major watersheds of Western Washington and encompasses nearly 200 square miles (King County, 1993). This basin includes hundreds of streams, and encompasses much of the greater Seattle urban area. The proposed projects lie primarily within heavily developed portions of the suburbs east of Seattle. The Cedar and Sammamish are the major rivers in this basin. The Cedar River/Lake Washington watershed includes all project basins except Soos Creek, Black River, and Lower Green River, as shown in Figure 4.1.

Cedar River flows are controlled by three dams located upstream of the study area. The Overflow Dike at River Mile (RM) 37.2 impounds Chester Morse Lake, the Masonry Dam at RM 35.6 generates hydropower, and the Landsburg Diversion Dam at RM 21.6 diverts flow from the Cedar River to supply about 70 percent of greater Seattle's water supply (King County, 1993). The City of Seattle manages most of the upper two-thirds of the watershed lying upstream of these dams for high-quality water runoff.

4.1.1.2 Green/Duwamish Watershed

The Green/Duwamish River watershed (WRIA 09) drains the southern part of the study area. Approximately river miles (RM) 11 through 21 of the Green River flow through this portion of the project (Figure 4.1). Basins within the study area have been defined as Lower Green River, Black River, and Soos Creek (King County, 1999). The study area of the Green/Duwamish watershed includes heavily-developed suburban areas, including primarily industrial areas in the cities of Kent and Renton.

Green River flows are controlled by Howard A. Hanson Dam at RM 64.5. The dam was completed in 1962. It has not only blocked upstream fish migration passage, but its control of flooding in the lower Green River valley has allowed rapid, intensive industrial development that adversely affects salmonid habitat and water quality (Grette and Salo, 1986).

4.1.1.3 Drainage Alteration History

The current drainage patterns indicated by Figure 4.1 reflect major changes that occurred within the study area early in the 20th century (Grette and Salo, 1986; King County, 1993). Before 1916, the Cedar River discharged directly to the Black River, and Lake Washington discharged to the Duwamish through the Black River. The Duwamish was formed by the confluence of the Green and Black rivers. The Black was a short, low gradient river by which Lake Washington and the Cedar River drained to the Duwamish, and the Lake had no other outlet.

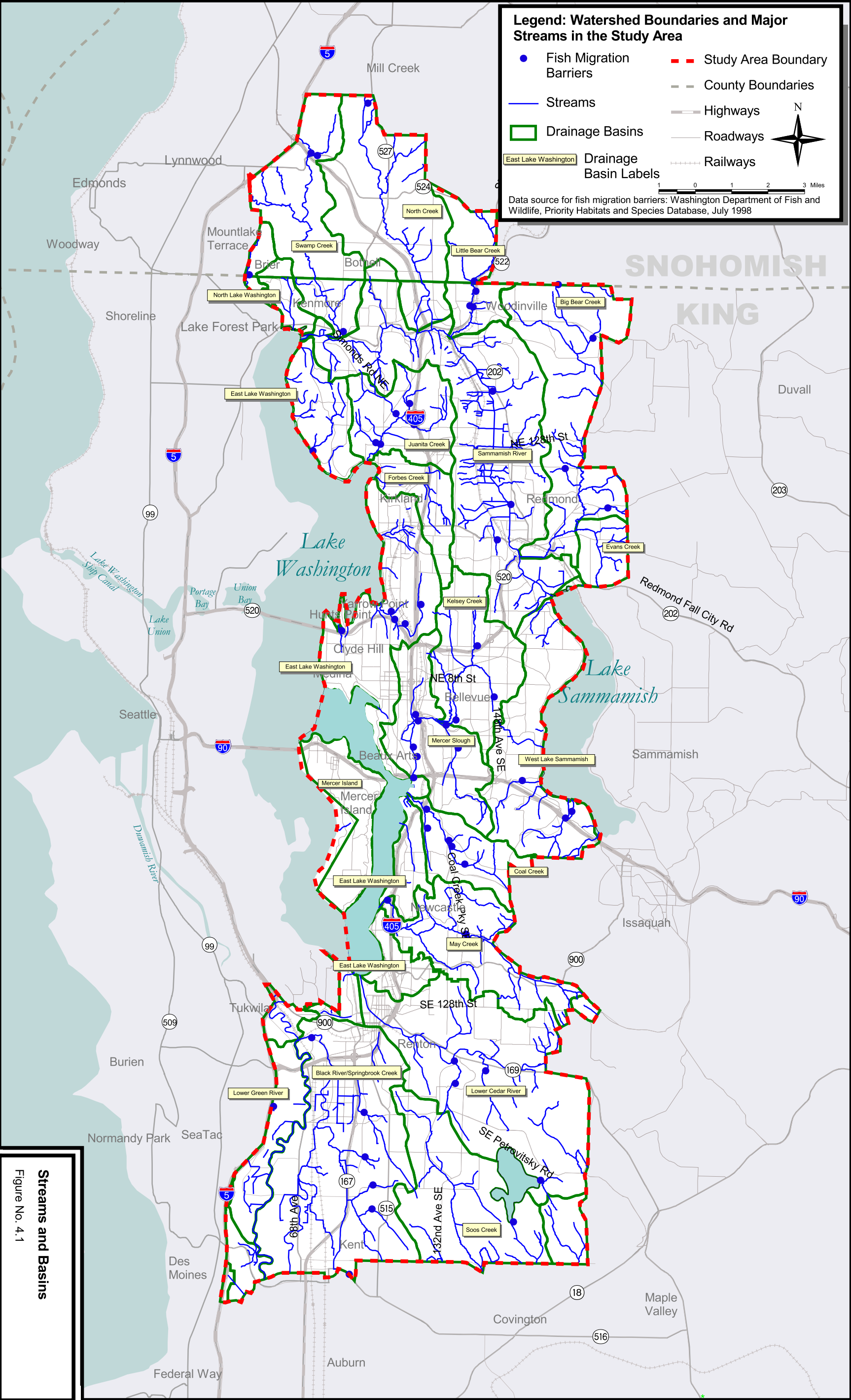
In 1916, the Lake Washington Ship Canal was completed and opened. The Ship Canal connecting Lake Washington directly to Puget Sound through Lake Union and the newly constructed Ballard Locks had created a new outlet for Lake Washington. Opening this connection lowered Lake Washington's water level by 8 feet, cutting off the Lake's outlet through the Black River. Thus the Black River was reduced to a minor tributary basin, and a large proportion of the Duwamish River's source flow was removed. In addition, the Cedar River was artificially diverted from the Green River to supply additional water through Lake Washington for operation of the new Ballard Locks. Upstream of the study area, the White River had also been diverted from its Green River confluence and directed southward to the Puyallup River in 1906. Overall, the drainage basin of the Duwamish River was reduced by about 70 percent by these major diversions, and the Lake Washington drainage basin was substantially increased by the addition of the Cedar River.

Lowering of the Lake Washington water levels had substantial effects on the hydrology of the entire watershed. Before that time, the Sammamish River had been a meandering, low-gradient stream that frequently occupied its floodplain, and supported an extensive complex of mature forested wetlands. The lowering of Lake Washington increased the River gradient and flow, effectively draining many of the Sammamish River wetlands (King County, 1993; King County, 2001).

The Black River was dammed in 1958 for flood control. In 1972, this dam was replaced by the Black River Pumping Station, which acts as a "reverse dam" to prevent Green River flood flows from backing upstream into the Black River basin. This facility presents a partial barrier to coho salmon (*Oncorhynchus kisutch*) and prevents successful spawning by chinook (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*) (King County, 2000).

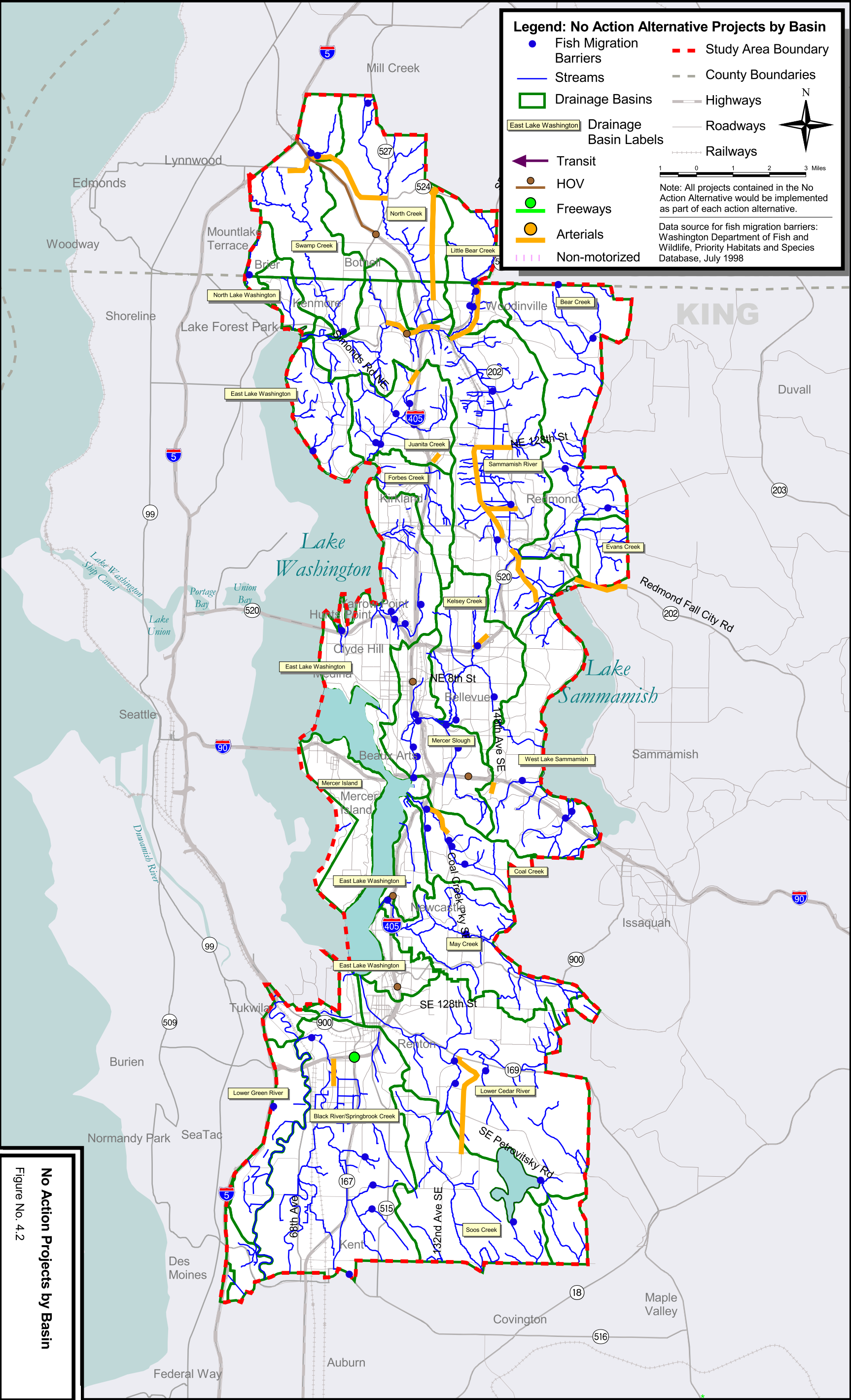
Numerous streams within the study area have been channelized, dredged, or diked since the settlement of the region in the 1800s. Nearly the entire portions of the Green River and Sammamish River within the project are contained within dikes, and the Sammamish has been systematically deepened, straightened, and armored as well (Grette and Salo, 1986; King County, 2001). The valley floor streams in the Black River basin have been mostly channelized over the years (King County, 2000). The lower two miles of the Cedar River are contained in the artificial channel that was constructed for diversion to Lake Washington (King County, 1993).

Diking and channelization have had numerous adverse effects on salmonids, including loss of connection to off-channel habitat, clearing and suppression of riparian vegetation, elimination of shallow edgewater habitats, and increases in scouring and erosion (Grette and Salo, 1986). Channelization-induced changes in flow velocities may directly interfere with both upstream and downstream fish migration by flushing juvenile fish rapidly downstream, and eliminating resting areas for migrating spawners. By preventing channel migration across the floodplain, channelization generally suppresses a broad range of habitat functions including large woody debris recruitment, and side-channel formation.



Streams and Basins

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No Action Projects by Basin
Figure No. 4.2

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Table 4.1: Baseline Impervious Area by Basin

BASIN	Basin Area within Project (Acres)	Existing Conditions % Imperv. 2	Impervious Area within Project (Acres)	No Action (Baseline) Alternative	
				New Impervious	% Conv.4
Bear Creek 1	9,343	23%	2149	0	0.0%
Cedar River	13,809	see note 3	---	11.7	
Coal Creek	3,020	28%	846	1.3	0.0%
West Lake Sammamish	7,291	40%	2916	5.1	0.1%
East Lake Washington	13,104	40%	5242	13	0.1%
Evans Creek	1,560	22%	343	9.3	0.6%
Forbes Creek	2,322	43%	998	0	0.0%
Juanita Creek	4,208	45%	1894	10.4	0.2%
Kelsey Creek	5,291	44%	2328	0	0.0%
Lower Green River 1	3,837	47%	1,627	0	0.0%
Little Bear Creek	3,022	28%	846	14.6	0.5%
Sammamish River	16,375	37%	6059	18.9	0.1%
May Creek 1	5,858	22%	1289	9.1	0.2%
Mercer Slough (S. Kelsey)	5,137	46%	2363	12.4	0.2%
North Lake Washington	1,079	43%	464	0	0.0%
North Creek 1	8,357	38%	3176	32.8	0.4%
Soos Creek 1	9,408	17%	1599	7.8	0.1%
Black River (Springbrook)	14,293	44%	6289	5.7	0.0%
Swamp Creek 1	6,733	41%	2761	11.5	0.2%
Total	134,047	---	43,188	163.6	0.1%

Note:

1. A portion of this basin lies outside the project area.
2. Unpublished data, King County DNR GIS Data
3. Study-area impervious within this basin not available
4. % Conversion to new impervious surface. (New Imp. Area/Basin Area within Project.)

4.1.2 Fish Species Presence in the Study Area

4.1.2.1 Chinook Salmon

The Puget Sound chinook salmon is the only currently federally listed fish species known to exist in the study area. This species is listed as “threatened” under the ESA. The Puget Sound stocks of chinook salmon occur throughout much of the study area, in the Cedar, Green, and Sammamish rivers, as well as larger tributary streams including Swamp Creek, North Creek, Bear Creek, Little Bear Creek, Evans Creek, Mercer Slough, Coal Creek, May Creek, Kelsey Creek, and Soos Creek (King County, 2000; King County, 2001; WDFW, 2000). Chinook salmon typically use larger streams for most of their freshwater life stages. Each of the alternatives includes projects which cross several streams bearing chinook salmon. The 1992 WDFW inventory listed chinook stock population status as “healthy” for Issaquah Creek chinook (which migrate through the study area in the Sammamish River) and Duwamish/Green River chinook, both of which are sustained by non-native hatchery production. The native, wild stock of chinook using the Cedar River was of “unknown” status at that time (WDFW, 1992).

Although chinook salmon are not adapted to inhabit smaller tributaries, critical habitat for this species has been designated by the National Marine Fisheries Service (NMFS) to include all potentially accessible marine, estuarine, and river reaches. Critical habitat includes many streams not currently known to harbor chinook, and excludes only those above longstanding, naturally impassable barriers such as natural waterfalls (NMFS, 2000). Therefore, critical habitat includes nearly all streams in the entire study area portions of the Cedar/Lake Washington and Green/Duwamish basins.

Chinook salmon are anadromous (adults migrate from the ocean to spawn in fresh water streams). Localized depressions (redds) are made by spawning salmon in the gravel substrates of streams where the salmon lay their eggs. Migration for fall chinook generally during June through November, and spawning occurs from August through November. All adult salmon die soon after spawning. The eggs of the ocean-type chinook found in Puget Sound typically hatch in 90 to 150 days, after which the young emerge from the redd and remain in fresh water for several months (NMFS, 1999; Wydoski and Whitney, 1979). Following this period of development in fresh water, the juveniles (smolts) migrate downstream to the ocean.

Chinook generally require habitat conditions similar to those of other anadromous salmonids. During the migration lifestage, they require refuge in deep pools with cover such as large woody debris. For successful spawning, they require a steady supply of clean, cool, well-oxygenated water, and clean gravel. Water temperatures rising above a 7-day average maximum of 48°F for chinook are reported to limit spawning and rearing success for chinook species (USFWS, 1998; NMFS, 1998). During the freshwater rearing life stage, important factors influencing the survival of all juvenile salmonids include the availability of insect and other macroinvertebrate prey; refuge from seasonal high flow velocities; refuge from seasonal low water levels; cover from predators; and water quality including, adequately low water temperatures.

Habitat complexity is generally a major factor in meeting survival requirements for all salmonids. Key features of habitat complexity include interspersed deep pools and shallow gravel riffles,

abundant woody debris in the channel, and a forested riparian area to stabilize banks, provide shade, and provide organic inputs. Other factors that affect habitat quality include water regime alterations due to stormwater runoff from impervious or cleared areas, sediment deposition of potential spawning habitat, and competition from introduced exotic fish.

4.1.2.2 Coho Salmon

The Puget Sound/Strait of Georgia coho salmon is currently a “candidate” species for federal listing. WDFW current GIS database shows coho salmon presence in the major streams of all project-area basins except Mercer Island. Other sources, including the WRIA 9 habitat reconnaissance and local agency publications as referenced in Section 4.2, show coho salmon inhabiting many smaller streams in each basin. Coho salmon typically have similar habitat requirements as described for chinook, except that coho typically use all accessible waters in the streams they occupy, and may ascend as far as possible up small headwater streams. Unlike chinook, they have typically been observed in marginal habitat, including channelized streams and roadside ditches. In addition, coho have a much longer freshwater rearing life stage typically lasting one to two years (Wydoski and Whitney, 1979).

4.1.2.3 Bull Trout

Bull trout are federally listed as “threatened.” They are known to occur in both of the two major watersheds that compose the study area, but spawning has been documented only in locations far upstream of the study area (WDFW, 1998). The WDFW current GIS database shows bull trout presence in the study area to be limited to the mainstem Green River (WDFW, 2000). Other sources have documented bull trout presence within the study area in the Cedar River and Lake Washington (USFWS, 1999; USFWS, 2000). Bull trout were not found in the Sammamish River basin during a specific one-year bull trout survey of Lake Sammamish (USFWS, 1999; WDFW, 1998).

Bull trout have several different life history strategies including resident, fluvial, adfluvial, or anadromous. Resident headwater populations tend to be isolated remnants of historically more mobile populations and as such are more prone to extinction. Fluvial and adfluvial populations are typically associated with larger river and lake systems. Anadromous populations are very mobile, utilize marine waters for part of their adult life, and are more dependent on estuarine habitats for survival. In the marine environment, distribution of bull trout is associated with bait fish (surf smelt and herring) and bait fish spawning beaches (WDW, 1994).

Bull trout are bottom dwellers that prefer deep pools of cold water rivers, lakes, and reservoirs. In the Puget Sound region, the downstream limit of successful spawning always occurs upstream of the winter snow line (WDFW, 1999). Adults typically spawn in fall (October to early November), and juveniles hatch in winter, emerge from the gravel substrate in spring, and remain in these tributary streams for 1 to 3 years before migrating back toward lakes, large rivers, or the ocean. The post spawned adult bull trout vacate the spawning area almost immediately, typically traveling at least 50 kilometers downstream (WDFW, 1994). Bull trout require cold (maximum temperature approximately 13°C [55°F]) water lakes or streams with clean cobble substrate and large woody debris cover (Rodrick and Milner, 1991). Water temperatures rising above a 7-day average maximum of 8°C (46°F) are reported to limit spawning and rearing success for this species (USFWS, 1998). Bull

trout are particularly sensitive to sedimentation because of their relatively long incubation and development phase (Fraley and Shepard, 1989). Adults are primarily piscivorous, but will also consume eggs, insects, snails, and leeches. Juvenile bull trout consume primarily macroinvertebrates.

In summary, available documentation and habitat requirements information indicate that bull trout are not likely to spawn in the study area, but may migrate through it. Their low tolerance for warm water temperatures and sedimentation makes it likely that the study area provides potential habitat only for migration. Only the upper (off-site) reaches of the Green and Cedar rivers can potentially provide the “upstream of winter snow line” (WDFW, 1999) habitat necessary for successful spawning. Therefore, migrating bull trout may be present within the study area in the mainstem Green and Duwamish rivers, in the Cedar River, and in Lake Washington.

4.1.2.4 Other Salmonids

Although the Green River stock of pink salmon (*Oncorhynchus gorbuscha*) have been characterized as extinct, a few pink salmon have been observed and captured in the Green River (King County, 2000). These pink salmon may be strays from other Puget Sound runs, and a Green River run is not considered to exist (Grette and Salo, 1986). Pink salmon are not considered to inhabit the Lake Washington/Cedar River watershed.

The Green River supports a remnant natural run of chum salmon (*Oncorhynchus keta*) which is supplemented by the Muckleshoot Tribe’s hatchery operations. Spawning habitat occurs upstream of the study area, and emerging juvenile chum salmon migrate out almost immediately to rear in salt water estuaries (Grette and Salo, 1986). Therefore, chum salmon would use the Green River in the study area only for spawner migration and juvenile out-migration. A few chum salmon have been observed in Lake Sammamish tributaries; however, these are assumed to be strays from other stocks since no run is documented in the Cedar/Lake Washington basin.

Sockeye (*Oncorhynchus nerka*) are unique among the salmon in requiring lakes for part of their life cycle. Sockeye spawn in the gravel substrate of streams, or more rarely, on gravelly lakeshores. The emerging juveniles migrate quickly to lakes where they rear for one to two years before migrating to sea (Wydoski and Whitney, 1979). Sockeye occupy Lakes Washington and Sammamish. These sockeye originated from non-native stock introduced from Baker Lake in northwestern Washington (WDFW, 1992). Within the study area, they occur in the Cedar River, Sammamish River, and North, Swamp, Little Bear, Bear, Coal and May creeks.

Kokanee are sockeye salmon that spend their entire life cycle in fresh water lakes without migrating to salt water. These occur in Lake Washington, and have been reported to spawn in a number of study-area tributaries including Juanita, Bear, and Swamp creeks.

Coastal cutthroat trout (*Oncorhynchus darki*) are present in all study area basins. Sea-run cutthroat may be present in many of the accessible streams, and have even been documented in the urbanized East Lake Washington tributaries (Watershed Company, 1998). Resident cutthroat trout are widespread in small streams throughout the study area, including areas above migration barriers (May, 1996).

Winter runs of steelhead trout runs are present in both the Green/Duwamish and Cedar/Lake Washington portions of the study area, and both include native wild fish (Grette and Salo, 1986; King County, 1993; WDFW, 1992). A non-native summer steelhead run is also maintained in the Green/Duwamish basin (WDFW, 1992).

Mountain whitefish (*Prosopium Williamsii*) have been reported in the Cedar River. Atlantic salmon (*Salmo salar*) have been found recently in the Green River, and are assumed to be escaped from net pen fish farming operations in Puget Sound (King County, 2000).

4.1.2.5 Native Non-Salmonids

Non-salmonid native fishes distributed widely throughout large and small streams in the study area include the various species of sculpins (*Cottus* spp.), dace (*Rhinichthys* spp.), stickleback (*Gasterosteus aculeatus*), and lampreys (*Lampetra* spp.). Species that reside mainly in Lakes Washington and Sammamish but may venture into streams include suckers (*Catostomus* spp.), smelt (*Spirinchus* spp.), and chubs (*Mylocheilus* spp.) (King County, 1993).

4.1.2.6 Exotic Non-Salmonids

Numerous non-native exotic and invasive fishes including various species of bullheads, bass, perch and sunfish. Several of these introduced “warmwater” fish may prey on juvenile native salmon smolts (Wydoski and Whitney, 1979). Smallmouth and largemouth bass in particular have been found to consume substantial numbers of outmigrating salmonid smolts in Lake Washington and the Ship Canal.

4.2 Baseline Conditions by Basin

4.2.1 North Lake Washington Basin

The North Lake Washington Basin is defined here as occupying 1,079 acres in the western edge of the study area west of Swamp Creek (Figure 4.1). The basin lies largely within the City of Bothell, and lies entirely within the Urban Growth Area. The basin is drained by one main stream discharging to Lake Washington (King County, 1987).

Coho salmon have been assumed to access this stream (Williams et al., 1975). Resident cutthroat trout may be present. The basin is heavily urbanized, and impervious surface occupies about 43 percent of it (Table 4.1).

4.2.2 Swamp Creek Basin

Swamp Creek drains about 6,733 acres within the study area (16,000 acres total) immediately east of Lake Washington (King County, 1999) (Figure 4.1). The northwestern portion of the basin lies outside the study area. The study area portion of this basin includes portions of the City of Kenmore, Mountlake Terrace, Bothell, Snohomish County, and King County jurisdictions. The entire project-area portion of the basin lies within designated Urban Growth Area.

Coho, chinook, kokanee, and sockeye salmon, as well as steelhead, and resident and sea-run coastal cutthroat trout use Swamp Creek. Salmon populations in this basin, however, have decreased substantially from historic levels, and fall chinook are now almost absent (Snohomish County, 1994).

Salmonid habitat has been degraded by development in this watershed. The basin is rapidly urbanizing, and about 41 percent of the study area portion of it is occupied by impervious surface (King County, 1999). Habitat degradation in the basin includes loss of flood plain connectivity, lack of large woody debris, riparian disturbance, and altered hydrology (King County, 2001). However, a number of remnant patches retain high-quality riparian vegetation and stream habitat in the Snohomish County reach within the study area (May, 1996). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.3 North Creek Basin

North Creek drains about 8357 acres within the study area and discharges to the Sammamish River (King County, 1999) (Figure 4.1). The basin includes a number of tributaries including Tambark Creek and Penny Creek. The study area encompasses the portion of this watershed extending from the mouth of the stream to about RM 10.5, and falls within parts of the Lynnwood, Bothell, Snohomish County, and King County jurisdictions. The entire project-area portion of the basin lies within designated Urban Growth Area.

North Creek is used by chinook, sockeye, kokanee, and coho salmon, as well as steelhead. However, only one chinook redd was found during 1999 spawning monitoring. The stream is also inhabited by coastal cutthroat trout (King County, 2001).

Salmonid habitat has been degraded by intensive urbanization in this watershed. About 38 percent of the project-area portion of the basin is occupied by impervious surface (King County, 1999). This development has altered basin hydrology to the extent that the current 2-year flood discharge is now estimated to exceed the historical 100-year flood discharge (King County, 2001). These altered watershed conditions have led to excessive channel scouring and widening, erosion, reduction in pool habitat, and degradation of the benthic macroinvertebrate community. In addition, the exaggerated high peak and low base flows caused by watershed development have resulted in many stream reaches going dry in summer. Channel scouring has motivated property owners to armor much of the streambank, exacerbating the effects of unnatural conditions. Clearing of riparian vegetation has perpetuated the lack of large woody debris, resulting in a lack of the instream complexity that forms the basic structure of fish habitat formation. These changes limit all life stages of the salmonid species by reducing spawning and rearing habitat (King County, 2001). The baffled culvert for Perry Creek under I-405 at milepost 26.46 has been identified as a 67 percent fish barrier (WDFW, 2000A).

North Creek exhibits several chronic water quality problems that are likely to limit salmonid survival. Water temperature monitoring found numerous water temperature excursions beyond 16 C°, which is likely to limit successful salmonid rearing. DO (dissolved oxygen) has often been measured below state standards in the past, and levels of fecal coliform, lead, copper, and zinc have exceeded state standards (King County, 2001; Snohomish County 1994a). Based on available GIS information, two fish migration barriers have been documented in this basin (Figure 4.1).

4.2.4 Little Bear Creek Basin

Little Bear Creek drains about 3,022 acres within the study area and discharges to the Sammamish River (Figure 4.1). The study area encompasses the lower and western parts of this basin, extending from the stream mouth to about RM 4. This project-area portion of this basin falls within City of Woodinville and Snohomish County jurisdictions. Most of the basin lies beyond the designated Urban Growth Area.

Chinook, sockeye, kokanee, and coho salmon, as well as steelhead use little Bear Creek. The stream is also inhabited by coastal cutthroat trout (King County, 2001).

Although this is one of the least urbanized portions of the study area, salmonid habitat has still been degraded by intensive development. About 28 percent of the project-area portion of the basin is occupied by impervious surface (King County, 1999). Documented habitat limitations in the study area include the upper reaches of Little Bear Creek and tributary streams going dry in summer, and excessive channel scouring in the lower stream reaches. Extensive riparian clearing has resulted in a scarcity of large woody debris and pools, as well as channel degradation in the lower reaches (King County, 2001).

Monitoring efforts have found several chronic water quality problems in Little Bear Creek that are likely to limit salmonid survival. Fecal coliform levels have “routinely” exceeded state standards, and nitrate levels are among the highest in Snohomish County. Preliminary results of pesticide monitoring indicate a variety of pesticides in the stream water, including some violations of State water quality standards (King County, 2001). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.5 Juanita Creek Basin

Juanita Creek drains a basin located immediately northeast of Lake Washington, and lies entirely within the study area. The entire project-area portion of the basin lies within the Urban Growth Area and includes the jurisdictions of King County and the City of Kirkland (Figure 4.1).

Sockeye and coho salmon, as well as steelhead use Juanita Creek. The stream is also inhabited by coastal cutthroat trout including sea-run cutthroat trout (Watershed Company, 1998).

Salmonid habitat has been severely degraded by intensive urbanization in this watershed (May, 1996). About 45 percent of the basin is now covered by impervious surface (King County, 1999). Parts of the stream are channelized within armored banks through urban areas. However, several large wetlands remain in the upper portion of the watershed. Based on available GIS information, four fish migration barriers have been documented in this basin (Figure 4.1).

4.2.6 Forbes Creek Basin

Forbes Creek drains about 2,322 acres immediately east of Lake Washington (King County, 1999) (Figure 4.1). The stream flows through Forbes Lake on its route to Lake Washington. Three minor tributaries discharge into Forbes Creek downstream of Forbes Lake. The study

area encompasses the entire basin, which includes portions of the City of Kirkland and King County jurisdictions. The entire basin lies within designated Urban Growth Area.

Forbes Creek is used by coho salmon and coastal cutthroat trout. Non-salmonid species found during recent sampling also included stickleback, lamprey, and dace. The limit of upstream migration is a piped section under a parking lot above Forbes Creek Drive (Watershed Company, 1998).

Salmonid habitat has been degraded by intensive development in this watershed. The basin is heavily urbanized and is occupied primarily by industrial parks, residential development, and small remnants of rural residential land use. Many reaches of Forbes Creek upstream of the lake, as well as most reaches of Forbes' tributaries, have been tightlined through pipes, eliminating all habitat (King County, 1987a). The Forbes basin is currently about 43 percent impervious surface (King County, 1999). However, extensive wetlands and open space corridors occupy the riparian area downstream of Forbes Lake (Watershed Company, 1998).

4.2.7 Sammamish River Basin

The Sammamish River is a 15.3-mile long river flowing from Lake Sammamish to Lake Washington, and is entirely within the study area. The River drains a basin of about 16,375 acres within the study area (excluding Bear and Little Bear creeks, which are discussed separately in this report). The Sammamish River has been thoroughly altered from natural conditions by the extensive channel modifications described in Section 4.1.1. Most of the basin lies within designated Urban Growth Area, and most of the former floodplain has been drained, filled, and developed (King County, 2001). This basin includes sections of King County and City of Renton jurisdictions.

The mainstem Sammamish River within the project area is used by coho, sockeye, kokanee, and chinook salmon, as well as steelhead, sea-run cutthroat trout, resident trout, and non-salmonids (King County, 2001). The bull trout's low tolerance for warm water temperatures makes it unlikely that any populations would survive in this urbanized, low-elevation basin. In fact, in the Puget Sound region, the downstream limit of successful spawning always occurs upstream of the winter snow line (WDFW, 1999). This would preclude spawning in the Sammamish River basin, which does not extend to elevations above the snow line. Bull trout were not found in the Sammamish River basin of the Lake Washington watershed during a specific one-year bull trout survey of Lake Sammamish (WDFW, 1998).

The mainstem Sammamish is underlain almost entirely by silty substrate that limits spawning habitat, and rearing habitat is limited by sparse large woody debris and a nearly complete absence of pools (King County, 2001). Channelization as described in Section 4.1.1 has largely removed riparian vegetation and cut off most off-channel habitat (King County, 2001). Therefore, salmonid use is largely as a migration corridor to better habitats upstream including the Bear Creek basin.

About 37 percent of the basin is now occupied by impervious surface (King County, 1999). Urbanization in the basin has brought about higher peak flows and lower base flows than would be expected under natural conditions. Water temperatures that are stressful or lethal to salmon (over 25 C°) have been documented, as well as levels of DO that are below the optimum range for salmonids (King County, 2001). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.8 Bear Creek Basin

Bear Creek drains about 9,343 acres within the study area and discharges to the Sammamish River (Figure 4.1). Bear Creek borders the eastern edge of the study area, and the study area includes the western portion of the basin. This area falls within City of Redmond and King County jurisdictions. Most of the basin lies beyond the designated Urban Growth Area.

Bear Creek remains relatively productive among Puget Sound salmon streams, supporting populations of chinook, sockeye, kokanee, and coho salmon, as well as steelhead, rainbow, and coastal cutthroat trout (King County, 1990).

Although this is one of the less urbanized portions of the study area, salmonid habitat has still been degraded by rapid recent development. About 23 percent of the project-area portion of the basin is occupied by impervious surface (King County, 1999). Downstream of its Cottage Lake Creek confluence, Bear Creek is predominantly degraded by the effects of urbanization, including channelization, areas of excessive scour and sedimentation, riparian disturbance, large woody debris removal, and hydrology alteration (King County, 1989). However, the upstream portions of the basin include numerous reaches of intact, high-quality salmonid habitat (May, 1996). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.9 Evans Creek Basin

Evans Creek drains about 1,560 acres within the study area and discharges to Bear Creek (Figure 4.1). Evans Creek borders the eastern edge of the study area, and the study area includes the western portion of the basin. This area falls mainly within King County jurisdiction. Most of the basin lies beyond the designated Urban Growth Area.

Evans Creek supports populations of chinook, sockeye, kokanee, and coho salmon, as well as steelhead, rainbow, and coastal cutthroat trout. Rutherford Creek, an Evans tributary, has been reported as one of the most productive coho salmon streams among Bear Creek tributaries (King County, 1990).

Evans Creek is underlain by relatively unstable geologic deposits, and has been particularly vulnerable to natural and development-induced erosion. Twenty-three percent of the on-site portion of Evans Creek basin is occupied by impervious surface. Habitat has been degraded by accelerated erosion and sedimentation in the study area reach due to stormwater alterations in upstream reaches (King County, 1990).

4.2.10 East Lake Washington Basin

The East Lake Washington Basin is defined here as a catch-all basin to include extensive areas distributed along the entire east shore of the Lake that do not fall within any of the major-stream drainage basins (Figure 4.1). The basin drains a total area of 13,104 acres, and lies entirely within the study area. The basin lies entirely within the Urban Growth Area, and contains numerous jurisdictions including King County, Renton, Newcastle, Bellevue, Kirkland, Bothell, and Kenmore (Figure 4.1). Much of the area is characterized by extensive groundwater seeps, with short, ephemeral streams (King County, 1987).

Fish populations in most of the small streams in the basin are likely limited to cutthroat trout (King County, 1987). Non-salmonids including sculpins are also likely to inhabit some streams. Coho salmon may access the lowest reaches of some of these small streams, and have been documented in Cochran Springs Creek and Carillion Creek in the City of Kirkland (Watershed Company, 1998).

Habitat in all streams of the East Lake Washington basin has been degraded to some degree by urbanization. Extensive reaches throughout the basin have been tightlined or channelized. Other stream reaches throughout the basin have been degraded by hydrologic alterations, including runoff from impervious surfaces and direct discharge from drainage pipes. Numerous small barriers throughout the basin limit fish migration in small streams. Many parts of the basin, including the northern- and southernmost areas, have been completely urbanized. The most usable remnants of fish habitat are in the Finn Hill area on the northeast shore of the Lake. Streams in deep ravines here have been left relatively undisturbed, and good habitat occurs in a few tributaries (King County, 1987). The 370-foot long Yarrow Creek culvert under I-405 at milepost 15.09 has been identified as a 100 percent fish migration barrier (WDFW, 2000A). Based on available GIS information, four fish migration barriers have been documented in this basin (Figure 4.1).

4.2.11 Kelsey Creek Basin

Kelsey Creek drains a basin located between Lakes Sammamish and Washington, and lies entirely within the study area. The basin lies entirely within the Urban Growth Area, and primarily within the jurisdiction of the Cities of Bellevue and Redmond (Figure 4.1). The stream discharges to Lake Washington at Mercer Slough.

Coho salmon, steelhead, and coastal cutthroat trout use Kelsey Creek (May, 1996).

Kelsey Creek basin is highly urbanized, and includes a number of reaches that have been channelized or tightlined (May, 1996). About 45 percent of the basin is now covered by impervious surface (King County, 1999). Much of the stream displays degraded habitat effects typical of urban areas including disturbed or fully cleared riparian areas, excessive scouring and sedimentation, lack of large woody debris, lack of pool habitat, and bank erosion. Only a few limited reaches of Kelsey and its tributaries still retain remnants of good riparian and in-stream salmonid habitat (May, 1986). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.12 Mercer Slough (South Kelsey Creek) Basin

Mercer Slough drains a basin centered on I-405 on the east shore of Lake Washington, and lies entirely within the study area. The basin lies entirely within the Urban Growth Area, and primarily within the jurisdiction of the City of Bellevue (Figure 4.1). Mercer Slough is a low-gradient arm of Lake Washington that lies within a broad wetland valley. The slough is fed by Sturtevant Creek and Kelsey Creek, which is treated as a separate basin in this report.

Coho salmon, steelhead, sockeye, and coastal cutthroat trout use Mercer Slough as a migration corridor to Kelsey Creek and for rearing habitat. Sturtevant Creek is used by coho salmon (Williams et al., 1975).

The Mercer Slough (South Kelsey Creek) basin is highly urbanized and has the highest proportion of impervious cover of any study-area basin at 46 percent. However, this basin also includes large remnant wetlands including those surrounding the lower slough and another broad wetland area upstream of I-405. Sturtevant Creek has been largely channelized, with substantial reaches flowing through culverts and tightlines. Based on available GIS information, five fish migration barriers have been documented in this basin (Figure 4.1).

4.2.13 West Lake Sammamish Basin

The West Lake Sammamish Basin is defined here as a catch-all basin to include the portion of the project area that drains eastward to Lake Sammamish (Figure 4.1). The basin drains a total area of 7,291 acres within the project area, and lies largely within the City of Bellevue. The basin lies entirely within the Urban Growth Area (Figure 4.1). The basin contains six main streams, including Squibb Creek and Lewis Creek, all of which originate on hill slopes south of I-90.

Fish populations in most of the small streams in the basin are likely limited to cutthroat trout (King County, 1987). Non-salmonids including sculpins are also likely to inhabit some streams. Coho salmon may access the lowest reaches of some of these small streams, but I-90 crossings have essentially eliminated nearly all anadromous use upstream of the highway (King County, 1987b).

Habitat in all streams of the West Lake Sammamish basin has been degraded by urbanization. Impervious surface occupies 40 percent of the basin (King County, 1999). The resulting hydrology alterations have caused accelerated erosion and mass-wasting, resulting in sedimentation of potential spawning and rearing habitat in lower reaches despite some sediment trapping at the I-90 drainage structures (King County, 1987). Based on available GIS information, three fish migration barriers have been documented in this basin (Figure 4.1).

4.2.14 Coal Creek Basin

Coal Creek is a Lake Washington tributary that drains about 4,500 acres in King County and the City of Bellevue (King County, 1987c). The lower portion of the basin, encompassing about 3,020 acres, lies within the study area (Figure 4.1). The entire on-site portion of the basin falls within the designated Urban Growth Area.

Coal Creek is used by coho and sockeye salmon, and rainbow and cutthroat trout (King County, 1987c).

The Coal Creek Basin Plan (King County, 1987c) reported that habitat for anadromous fish was generally good in the upper reaches, but was poor in the lowest reaches due to riparian forest clearing and sedimentation. The basin has been altered by a history of intensive mining activity and by current rapid urbanization. About 28 percent of the study-area portion of the Coal Creek basin is occupied by impervious cover (King County, 1999). However, impervious cover for the overall basin is likely to be lower because much of the off-site headwater areas are protected by Cougar Mountain Park. Tributaries generally provided fair to poor habitat because they lacked instream cover (woody debris) and had fine-grained substrates that were not suitable for salmonid spawning.

Mine debris and excavations have altered water quality in this basin (May, 1986; King County, 1987c). Conductivity of surface water has been elevated throughout the basin, and concentrations of several metals were found to exceed acute and chronic toxicity levels for salmonids. In addition, elevated concentrations fecal coliform and suspended solids have typically been found during water quality monitoring in lower Coal Creek. Excessive sediment from mining debris and erosion has contributed to formation of a large delta extending into Lake Washington at the mouth of Coal Creek. The stream has been channelized in this vicinity, and has been diverted several times to allow for changing land uses along the lake shore (May, 1986; King County, 1987c). The baffled culvert that conveys Coal Creek under I-405 at milepost 10.12 has been identified as a fish migration barrier (WDFW, 2000A). Based on available GIS information, four fish migration barriers have been documented in this basin (Figure 4.1).

4.2.15 May Creek Basin

May Creek is a Lake Washington tributary that drains about 14 square miles in King County and the Cities of Newcastle and Renton (Shapiro and Associates, Inc., 1998). The lower portion of the basin, encompassing about 5,858 acres, lies within the study area (Figure 4.1). The majority of the on-site portion of the basin falls within the designated Urban Growth Area.

May Creek supports sockeye, coho, and chinook salmon, as well as cutthroat, steelhead, and rainbow trout. Spawning escapement of all anadromous salmonids has declined in May Creek, most dramatically for wild coho salmon. Because of its relatively small size, May Creek has been a minor producer among Lake Washington/Cedar River chinook streams (Foster-Wheeler, 1995).

Riparian and stream habitat conditions within this basin are generally poor because of the effects of human land development including riparian clearing, hydrologic alterations, accelerated erosion and sedimentation. Impervious surface occupies about 22 percent of the on-site portion of the basin. In many stream reaches of this basin, sedimentation limits spawning, sparseness of large woody debris limits rearing habitat, and periods of high water turbidity occur (Foster Wheeler, 1995). A culvert blocks fish migration at RM 7.7. Flooding and wet-season inundation are prevalent in the May Creek valley floodplain. Although seasonal flooding is natural in this area, development of the basin has increased the frequency and duration of floods. Based on available GIS information, one fish migration barrier has been documented in this basin (Figure 4.1).

4.2.16 Lower Cedar River Basin

The Cedar River drains one of the major watersheds in Western Washington. The project-area reach encompasses a 13,809-acre portion of the basin, encompassing about the lower six miles of the river and watershed, including tributary streams Ginger Creek, Maplewood Creek, Molasses Creek, and Madsen Creek. This reach of the Cedar River has been thoroughly altered by the extensive channel modifications described in Section 4.1.1. Most of the on-site portion of the lower basin lies within designated Urban Growth Area, and most of the former floodplain in this area has been drained, filled, and developed for agriculture or urban use. This basin includes sections of King County and City of Renton jurisdictions.

Sockeye, coho, and chinook salmon, as well as bull trout, Dolly Varden char, steelhead, sea-run cutthroat trout, resident trout, mountain whitefish, and non-salmonids occur in the project-area reach (King County, 1993). Spawning and rearing habitat are limited in this reach, but all anadromous species must migrate through it to the extensive habitat in upstream portions of the watershed. No fish hatcheries are present in this basin, but hatchery stock coho and chinook salmon have been frequently released, and the large sockeye run in this river was created from introduced sockeye after the River was diverted to Lake Washington in 1916 (King County, 1993).

Fish use has been documented in several project-area tributaries. Fish use in Ginger Creek is limited by a natural waterfall as well as urbanization impacts. Coho salmon access the lower portions of Maplewood Creek, and resident cutthroat trout are common throughout. Molasses and Madsen creeks support primarily resident cutthroat trout populations. Historic populations of steelhead, coho salmon, and sockeye have been largely eliminated from Madsen Creek (King County, 1993).

Habitat alterations described in Section 4.1.1 have substantially degraded salmonid habitat in the lower Cedar River basin (King County, 1993). The channelization, diking, dredging, and urban development in this reach has created a predominantly artificial river reach, eliminated the River's connection to its floodplain, and degraded riparian conditions. Few large coniferous trees have regenerated, and large woody debris is scarce. Fine sediment deposition, water quality problems, and lack of pools and cover have severely limited habitat value in this reach for salmonid life stages other than migration (King County, 1993). However, the stream serves as an important migration corridor for salmon and steelhead access to more functional habitat throughout the extensive off-site portions of the watershed. Ginger, Maplewood, Madsen, and Molasses creeks have been degraded substantially by the effects of urbanization, including erosion, flow regime alteration, riparian clearing, and construction of migration barriers such as culverts (King County, 1993). Based on available GIS information, four fish migration barriers have been documented in this basin (Figure 4.1).

4.2.17 Soos Creek Basin

Soos Creek is a Green River tributary that drains about 70 square miles in south King County (King County, 1990a). Soos Creek flows south from the study area to discharge into the Green River upstream of the study area (Figure 4.1). The study area encompasses 9,408 acres in the upper portion of this basin, including Big Soos Creek from about RM 8 to the headwaters at RM 14, as well as the upper drainages of tributaries Little Soos Creek and Jenkins Creek (King County, 1999). This project-area portion of this basin falls within parts of the City of Kent and King County jurisdictions. The western part of the project-area basin lies within designated Urban Growth Area.

Soos Creek is used by chinook, sockeye, kokanee, and coho salmon, as well as steelhead and sea-run cutthroat. An historic run of pink salmon has been extinct since the 1930s (King County, 1990a). The stream is also inhabited by coastal cutthroat trout (King County, 2001).

The Soos Creek Basin Plan (King County, 1990a) reported that habitat for anadromous fish was generally good, but that the ongoing conversion of land use from forest to agriculture and urban uses had already had substantial detrimental effects on streams. The tributaries Covington and Jenkins creeks had the most abundant fish habitat. Based on available GIS information, one fish migration barrier has been documented in this basin (Figure 4.1).

4.2.18 Black River (Springbrook Creek) Basin

The Black River is a short stream that had drained Lake Washington before flow was diverted as described in Section 4.1.1 of this document. Presently, the Black River basin drains about 15,763 acres, primarily through its tributary Springbrook Creek (King County, 2000). Springbrook receives water from Mill and Garrison creeks. About 14,293 acres of the basin lies within the study area, which falls within the jurisdiction of the Cities of Kent and Renton (King County, 1999). The entire on-site portion of the basin falls within the designated Urban Growth Area.

The Black River supports coho salmon and cutthroat and steelhead trout. The Black River Pumping Station serves as a dam to prevent Green River flood flows from backing upstream into the Black River basin. Although the Pumping Station includes facilities for upstream and downstream fish passage, their effectiveness is reported to be limited, and the Station effectively prevents successful chinook and steelhead spawning in the basin (King County, 2000). Aquatic insect analysis resulted in a B-IBI score of 10, which reflects poor conditions, on Mill Creek (King County, 2000).

Diversion and channelization as described in Section 4.1.1 have altered the Black River basin substantially. In addition, impervious surface occupies about 44 percent of the basin (King County, 1999). Much of Springbrook and Mill creeks have been converted to ditches. Riparian structure is generally limited to shrubs and immature deciduous trees which are not sufficient to support riparian functioning. Large woody debris is sparse to absent in most project-area reaches of these streams as well. Salmonid spawning is limited by the prevalence of silt substrate that has accumulated in these streams because of their flat gradient and accelerated erosion in upstream reaches of Garrison and Springbrook creeks (King County, 2000).

Water quality also typically limits salmonid habitat in this basin. Elevated concentrations of several heavy metals as well as fecal coliform have been documented in Springbrook Creek. In addition, high water temperatures and low dissolved oxygen levels have been found to violate Class A water quality standards, and to typically depart widely from optimal conditions for salmonids during the fall spawning season (King County, 2000). Based on available GIS information, five fish migration barriers have been documented in this basin (Figure 4.1).

4.2.19 Lower Green River Basin

The Green River drains one of the major watersheds in western Washington. The study area encompasses a 3,837-acre portion of the basin, extending from the upper reaches of the Duwamish River at about RM 9 to the lower reaches of the Green River up to about RM 25 (King County, 1999). The mouth of the Black River divides the Green from the Duwamish at RM 11. This basin includes portions of the Tukwila, Kent, and Sea-Tac jurisdictions (Figure 4.1). This reach of the Green/Duwamish occupies a meandering, low-gradient channel that has been mostly contained by levees and armoring as described in Section 4.1.1. The entire project-area portion of the basin lies within designated Urban Growth Area, and most of the former floodplain has been drained, filled, and developed. The substrate is mainly compacted silt, and riparian vegetation has been largely cleared by development (King County, 2000).

The mainstem lower Green River is a major transportation corridor for major stocks of anadromous salmonids en route to habitat throughout the extensive upstream watershed. Coho, chinook, pink, and chum salmon, as well as bull trout, steelhead, sea-run cutthroat trout, resident trout, and non-salmonids use the study area reach of the lower Green River at various life-stages. Salmonids are not known to use this reach for spawning, but migrate through it to upstream habitats, and may use it for rearing. Two hatcheries upstream of the study area, near the Green River on Soos Creek and Crisp Creek, produce summer/fall chinook, chum salmon, and steelhead, respectively. The Green River supports primarily summer/fall chinook, as man-made migration barriers upstream of the study area (Grette and Salo, 1986) have largely eliminated the historic spring runs. Runs of summer/fall chinook have actually tended to be higher during recent years, in contrast to the downward trend common to other Puget Sound stocks (King County, 2000). Only occasional observations of non-native fish species have been reported here (King County, 2000).

Salmonid habitat has been degraded substantially in the project-area reach by numerous types of disturbances (Grette and Salo, 1986; King County, 2000). Diversion of the White River from the Green to the Puyallup, as well as the Black River alterations described in section 4.1 of this report have substantially decreased the basin area and flow volumes of the project-area reach. Channelization has eliminated substantial rearing habitat by cutting off connections between the river and riparian wetlands and sloughs. Rearing habitat is reportedly the limiting factor for steelhead in the basin (Grette and Salo, 1986). Intensive urban development that was made possible in this basin by flood control impoundments has substantially adversely affected fish by altering the hydrologic regime to exaggerate peak and low flow volumes. Clearing of riparian vegetation has perpetuated the lack of large woody debris, resulting in a lack of the instream complexity that forms the basic structure of fish habitat.

Water quality has been chronically substandard in the lower part of the study area reach. This reach is included on Washington State's 303(d) list of impaired water bodies for temperature and for mercury contamination. Land clearing and development in upstream areas has increased sediment loading and water temperature in the on-site reach. Summer temperatures during the low flow season typically exceed 20 C°, which is above the optimum temperature range for salmonids, and DO levels are correspondingly reduced to below the optimum range (Grette and Salo, 1986; King County, 2000). The lower watershed has been substantially adversely affected by a history of toxic industrial pollution including PCBs and metals, and the Duwamish reach immediately downstream of the project is proposed as a federal Superfund site for hazardous waste remediation (Jackson, 2000). Remediation by removal or capping of contaminated areas has been undertaken in several areas, and water quality has improved substantially due to improving wastewater treatment and industrial effluent regulation (King County, 2000).

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5. IMPACT ANALYSIS

5.1 Direct Impacts

Two types of impacts are discussed here; construction, and operational. Construction impacts are direct impacts caused by the actual construction process, and may be temporary or long lasting. In this analysis, potential direct construction impacts are measured by number of riparian encroachment locations. Riparian encroachments are locations, including stream crossings, where clearing and grading within 300 feet of any stream would be required.

Operational impacts are direct impacts caused by the existence of the project and will perpetually affect the resource. In this analysis, potential direct operational impacts are measured by the area of new impervious surface.

It is important to note that the baseline condition for this impact analysis is not the existing conditions, but incorporates the impact of projects included in the “No Action” alternative. Since these projects are already committed regardless of the alternative chosen, it is assumed that they will have been constructed. The No Action impacts, as quantified by area of impervious surface and number of encroachments within 300 feet of streams, are displayed in Table 4.1.

5.1.1 Direct Construction Impacts

Projects that will require construction activities within, above, and/or along stream channels have potential adverse direct and indirect impact to fish habitat. The construction process can adversely impact on-site fish habitat by several means, including erosion and sedimentation, riparian disturbance, and discharge of toxic pollutants. Potential direct construction impacts are quantified as riparian encroachments (number of locations with potential clearing and grading within 300 feet of any stream) in Table 5.1. Project locations within basins are shown in Figures 5.1 through Figures 5.4.

Increased erosion resulting from work in the stream channels or vegetation clearing in riparian areas would lead to corresponding increases in fine sediment deposition in downstream areas. Erosion could occur on stream banks and terrestrial slopes disturbed by grading and clearing, and storm-water flows can carry eroded materials into streams.

Sedimentation in spawning habitats blocks the flow of oxygenated water through the gravel substrate, reducing emergence and survival of juvenile salmonids. This is also likely to adversely affect other resident fish, including sculpins, which depend upon intragravel habitat throughout their life history. Sedimentation can also affect fish by reducing the aquatic prey base. Aquatic insects typically are a necessary food source for salmonids. Sedimentation associated with land development has been found to reduce the abundance and diversity of aquatic insects by altering biochemical conditions, food resources, respiration, and habitable space. Scouring may displace spawning gravels or disrupt benthic communities.

Table 5.1: Riparian Encroachments Impacts by Basin

	Alt. 1		Alt. 2		Alt. 3		Alt. 4	
	Crossings	Within 300'	Crossings	Within 300'	Crossings	Within 300'	Crossings	Within 300'
Bear Creek	7	2	12	4	11	3	6	2
Black River	14	1	37	10	32	9	32	11
Coal Creek	1	1	2	1	0	1	2	0
East Lake Washington	23	2	38	2	17	0	9	1
Forbes Creek	15	6	24	9	10	5	17	6
Juanita Creek	3	0	8	0	4	0	13	0
Kelsey Creek	5	1	5	1	0	0	0	0
Little Bear Creek	1	0	2	1	1	2	2	2
Lower Cedar River	7	1	10	2	15	3	12	3
Lower Green River	1	0	3	0	1	0	5	0
May Creek	4	2	12	4	9	3	10	3
Mercer Slough	11	6	13	6	4	0	9	0
North Creek	9	0	16	0	13	0	11	0
Sammamish River	33	3	46	11	44	11	50	13
Soos Creek	4	1	4	1	4	1	0	0
Swamp Creek	5	0	10	0	5	0	9	0
West Lake Sammamish	0	0	5	0	1	0	1	0
TOTAL	143	26	247	52	171	38	188	41

On-site construction equipment is a potential source of toxic substances such as fuel, motor oil, and hydraulic fluid. These substances may kill or injure fish, amphibians, and benthic organisms if released into streams. They can be released both directly or through storm-water runoff and erosion of contaminated soil.

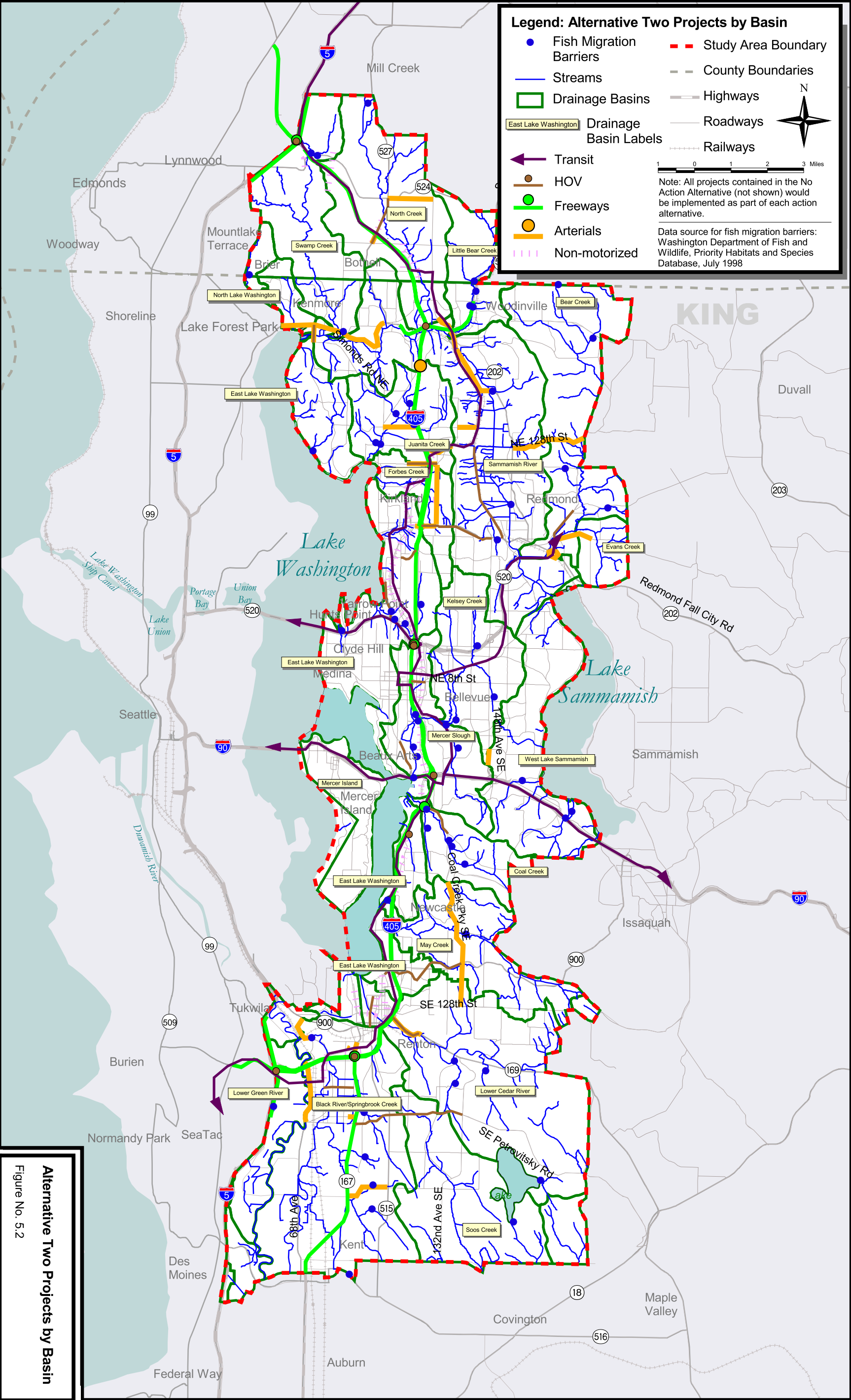
Fish populations are limited by low base-flow water levels during the dry season in many small streams. In these habitats, excessive sediment deposition can degrade or eliminate the pools that comprise the last refuges for fish as water levels decline.

5.1.2 Direct Operational Impacts

As described in Sections 1.0 and 2.0, the projects included in the alternatives range from non-construction demand reduction policies to construction of new freeway lanes. The primary potential operational impacts to stream habitat will result from those projects which create new impervious surfaces. Potential direct operational impacts are quantified as new impervious surface in Table 5.2 Effects of these new facilities will include reduction in riparian vegetation, toxic pollution, and alteration of hydrology.

Toxic pollution is typically caused by automotive-derived substances, such as petroleum hydrocarbons and heavy metals. These are typically found in roadway runoff, and may reach concentrations that are toxic to aquatic life when discharged into surface waters.

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Alternative Two Projects by Basin
Figure No. 5.2

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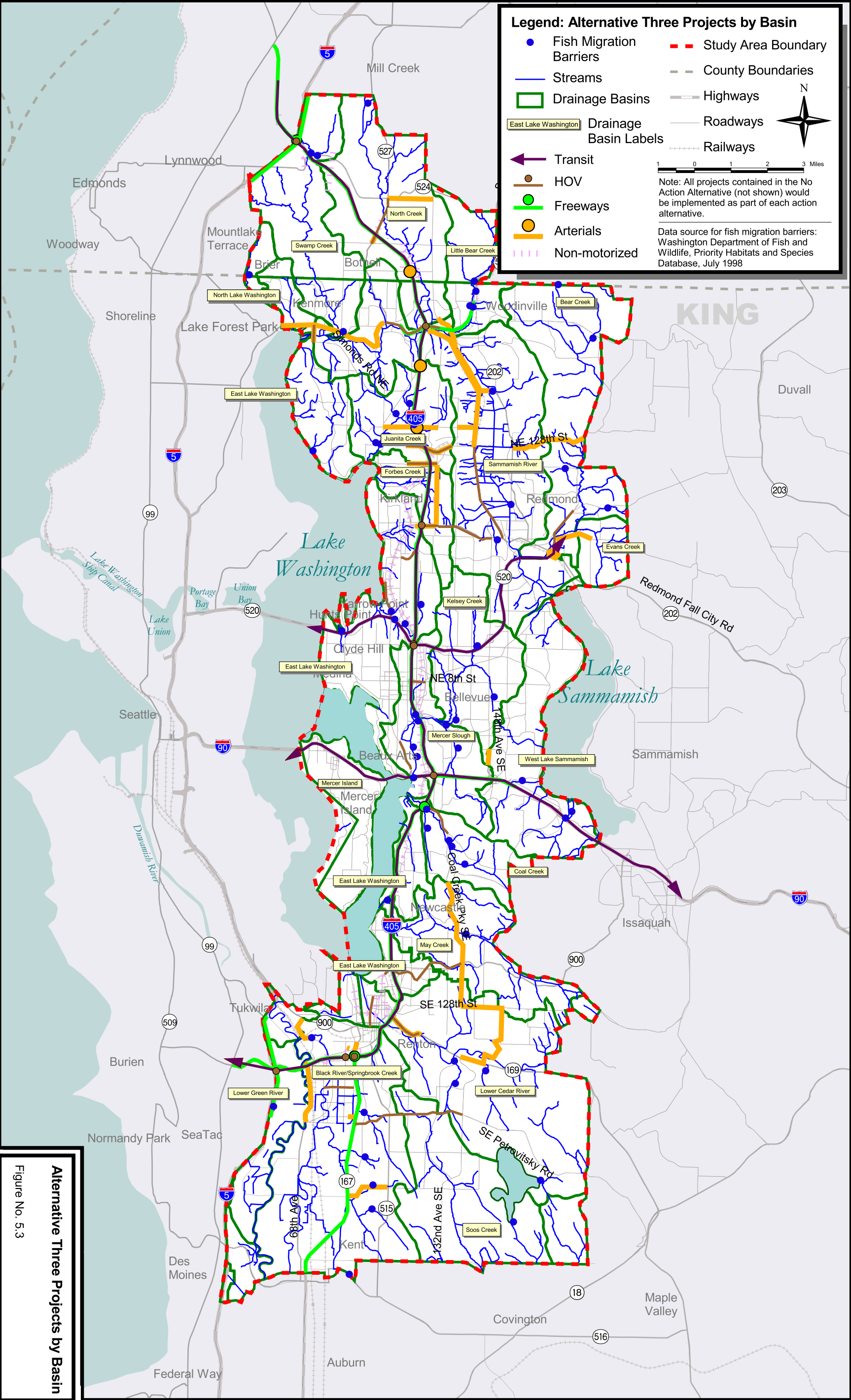


Figure No. 5.3

Alternative Three Projects by Basin

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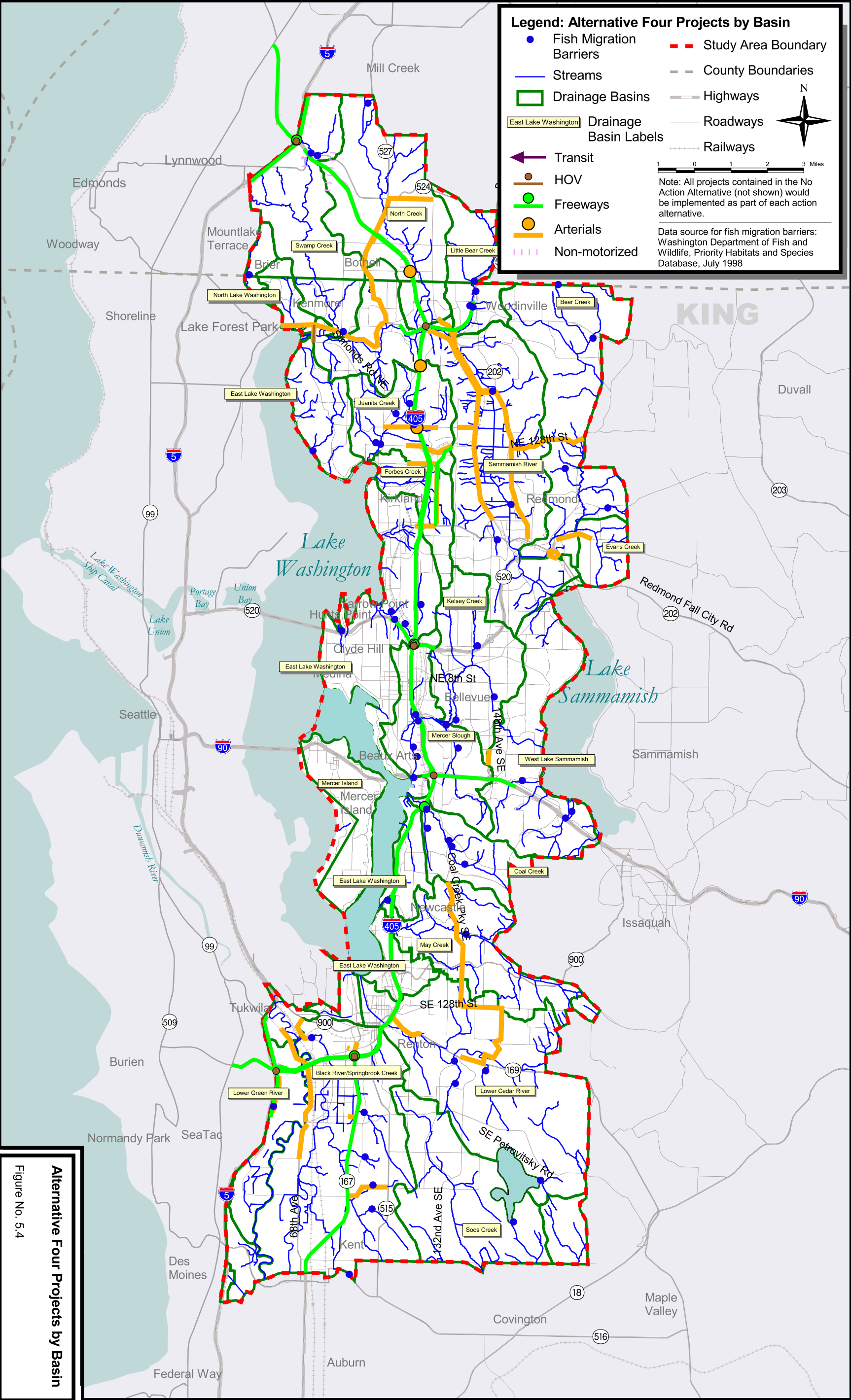


Figure No. 5.4

Alternative Four Projects by Basin

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Table 5.2: New Impervious Area Increase by Basin (Acres)

BASIN	Basin Area within Project (Acres)	% of Impervious ^b	Impervious Area within Project (Acres)	No Action Alternative		Alternative 1 HCT/TDM		Alternative 2 Mixed Mode with HCT/Transit		Alternative 3 Mixed Mode		Alternative 4 General Capacity	
				New Imp. Area (Acres)	% Conv. ^d	New Imp. Area (Acres)	% Conv. ^d	New Imp. Area (Acres)	% Conv. ^d	New Imp. Area (Acres)	% Conv. ^d	New Imp. Area (Acres)	% Conv. ^d
Bear Creek ^a	9,343	23%	2,149	0	0.0%	6	0.1%	23	0.2%	18	0.2%	17	0.2%
Cedar River	13,809	See note 3	---	12	^b	13	^b	21	^b	34	^b	33	^b
Coal Creek	3,020	28%	846	1	0.0%	12	0.4%	14	0.5%	12	0.4%	12	0.4%
West Lake Sammamish	7,291	40%	2,916	5	0.1%	7	0.1%	0	0.0%	0	0.0%	0	0.0%
East Lake Washington	13,104	40%	5,242	13	0.1%	30	0.2%	55	0.4%	60	0.5%	127	1.0%
Evans Creek	1,560	22%	343	9	0.6%	0	0.0%	3	0.2%	3	0.2%	3	0.2%
Forbes Creek	2,322	43%	998	0	0.0%	15	0.7%	23	1.0%	16	0.7%	32	1.4%
Juanita Creek	4,208	45%	1,894	10	0.2%	19	0.4%	31	0.7%	28	0.7%	66	1.6%
Kelsey Creek	5,291	44%	2,328	0	0.0%	14	0.3%	14	0.3%	0	0.0%	0	0.0%
Lower Green River ^a	3,837	47%	1,627	0	0.0%	4	0.1%	36	0.9%	34	0.9%	43	1.1%
Little Bear Creek	3,022	28%	846	15	0.5%	0	0.0%	4	0.1%	4	0.1%	4	0.1%
Sammamish River	16,375	37%	6,059	19	0.1%	29	0.2%	64	0.4%	76	0.5%	94	0.6%
May Creek ^a	5,858	22%	1,289	9	0.2%	5	0.1%	9	0.2%	4	0.1%	6	0.1%
Mercer Slough	5,137	46%	2,363	12	0.2%	35	0.7%	91	1.8%	84	1.6%	148	2.9%
North Lake Washington	1,079	43%	464	0	0.0%	.2	0.0%	.4	0.0%	.4	0.0%	.2	0.0%
North Creek ^a	8,357	38%	3,176	33	0.4%	28	0.3%	70	0.8%	78	0.9%	127	1.5%
Soos Creek ^a	9,408	17%	1,599	8	0.1%	7	0.1%	7	0.1%	7	0.1%	0	0.0%
Black River (Springbrook)	14,293	44%	6,289	6	0.0%	77	0.5%	139	1.0%	105	0.7%	133	0.9%
Swamp Creek ^a	6,733	41%	2,761	12	0.2%	3	0.0%	35	0.5%	35	0.5%	46	0.7%
Total	134,047	---	43,188	164	0.1%	304	0.2%	639	0.5%	598	0.4%	891	0.7%

^a A portion of this basin lies outside the project area.

^b Unpublished data, King County DNR GIS Data.

^c The available impervious area information for this basin covers a very large forested area outside of study area and was therefore not suitable for use.

^d % conversion to new impervious surface. (New impervious area divided by basin area within the study area.)

Riparian vegetation performs vital functions for stream habitat, including water temperature moderation, contribution of large woody debris, streambank stabilization, filtration of runoff, and contribution of small organic matter that supports the aquatic community. Projects that encroach on previously vegetated areas near streams are likely to reduce these riparian functions to the detriment of fish habitat.

Increases in impervious surfaces alter hydrology in several ways, including increased peak flows, decreased base flows, and increased erosion. Conversion to impervious surface speeds runoff and decreases infiltration and evapotranspiration. Urbanization also increases the drainage network and further accelerates the rate of stormwater runoff as it replaces natural drainage channels with numerous gutters, pipes, etc. These developments typically increase the frequency and magnitude of high-flow and flooding events in streams. This increase in peak high flows has been shown to have numerous adverse effects on aquatic habitat and on salmonid habitat in particular including the following (May, 1986):

- gravel that forms spawning habitat is displaced;
- existing salmonid eggs are washed out or crushed;
- benthic macroinvertebrate communities on which salmonids rely for food are degraded;
- channel erosion replaces pool and riffle habitat with less-habitable uniform runs and glides;
- juvenile fish are directly flushed downstream, and;
- stream flow fluctuation increases more as storm flow frequency increases.

As water runs off more quickly from these urbanized areas, there is typically a corresponding decrease in shallow groundwater recharge. Therefore, base flows are reduced, and water levels may decline much more quickly to levels inadequate for maintaining fish survival through the dry summer season.

Overall, severe degradation of stream habitat has been found to occur as impervious surface exceeds about 5 percent of the area in a drainage basin. Rehabilitation of habitat is generally likely to be feasible in streams for which impervious surface occupies less than 20 percent of the basin. Performance of fundamental natural ecological functions is likely to be problematic in streams with impervious surface covering more than 45 percent of their basins (May, 1986).

Biological integrity indexes that summarize the condition of the macroinvertebrate community have been measured throughout a number of stream segments in the study area (Kleindl, 1995). Most had biological index (B-IBI) scores reflecting a degraded macroinvertebrate community. Exceptions included reaches in North and Swamp creeks. Recent studies have found that biological integrity degrades rapidly as impervious surfaces occupy more than 5 percent of a given basin (May, 1986).

5.2 Impacts By Basin

Impacts to each study area basin, by alternative, are presented in Tables 5.1 and 5.2. Table 5.1 shows the number of locations at which proposed projects cross or encroach within 300 feet of any stream. Table 5.2 summarizes the estimated new impervious surface that would be constructed in each basin under the various alternatives.

5.2.1 North Lake Washington Basin Impacts

All action alternatives would create less than 1 acre of new impervious surface, and would create no new riparian environments.

5.2.2 Swamp Creek Basin Impacts

For Swamp Creek Basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams (Table 5.1). However, Alternative 4 would create the most new impervious surface (Table 5.2). Alternative 4 would convert 0.7 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 41 percent impervious cover.

5.2.3 North Creek Basin Impacts

For North Creek basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams by a moderate margin (Table 5.1). However, Alternative 4 would create the most new impervious surface by a wide margin (Table 5.2). Alternative 4 would convert an additional 1.5 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 38 percent impervious cover. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternative 4.

5.2.4 Little Bear Creek Basin Impacts

For Little Bear Creek basin, Alternative 4 would cause the highest number of encroachments within 300 feet of streams at a moderate 4 encroachments (Table 5.1). However, Alternatives 2, 3, and 4 would each convert an additional 0.1 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 28 percent impervious cover. All of the proposed projects for all Alternatives lie within the Urban Growth Area portion of the basin.

5.2.5 Juanita Creek Basin Impacts

For Juanita Creek basin, Alternative 4 would cause the highest number of encroachments within 300 feet of streams as well as the most new impervious surface by a wide margin

(Tables 5.1 and 5.2). Alternative 4 would convert an additional 1.6 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 45 percent impervious cover. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternative 4.

5.2.6 Forbes Creek Basin Impacts

For Forbes Creek basin, Alternative 2 encroachments within 300 feet of streams (Table 5.1). However, Alternative 4 would create the most new impervious surface by a wide margin (Table 5.2). Alternative 4 would convert 1.4 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 43 percent impervious cover. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternatives 2 and 4.

5.2.7 Sammamish River Basin Impacts

For the Sammamish River basin, Alternative 4 encroachments within 300 feet of streams, as well as the most new impervious surface (Tables 5.1 and 5.2). Encroachment at 63 locations represents the highest single-basin impact under any alternative by this measure. Alternative 4 would convert 0.6 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 37 percent impervious cover. One project under Alternative 4 extends beyond the Urban Growth Area. This is project R.AC-18, an expansion of Highway 202.

5.2.8 Bear Creek Basin Impacts

For Bear Creek basin, Alternative 2 encroachments within 300 feet of streams and would also create the most new impervious surface (Tables 5.1 and 5.2). However, Alternative 3 has only slightly less impact by both measures. Alternative 2 would convert 0.2 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 23 percent impervious cover. All of the proposed projects for all Alternatives lie within the Urban Growth Area portion of the basin.

5.2.9 Evans Creek Basin Impacts

For Evans Creek basin, no encroachments within 300 feet of streams are proposed under any alternatives. Alternatives 2, 3, and 4 would each convert an additional 0.2 percent of the on-site basin to impervious, in addition to the No Action baseline condition of 23 percent impervious cover. It should be noted that the No Action Alternative will convert more of the on-site basin to impervious cover than any of the action alternatives (Table 4.1). All of the proposed projects for all Alternatives lie within the Urban Growth Area portion of the basin.

5.2.10 East Lake Washington Basin Impacts

For the East Lake Washington basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams (Table 5.1). However, Alternative 4 would create the most new impervious surface by a wide margin (Table 5.2). Alternative 4 would convert an additional 1.0 percent of the on-site basin to impervious cover in addition to No Action baseline condition of 40 percent impervious cover. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternative 4.

5.2.11 Kelsey Creek Basin Impacts

For the Kelsey Creek basin, Alternatives 1 and 2 would cause the highest number of encroachments within 300 feet of streams as well as the most new impervious surface (Tables 5.1 and 5.2). Alternatives 3 and 4 would have no new encroachment or impervious surface. Either of Alternatives 1 or 2 would convert 0.3 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 44 percent impervious cover.

5.2.12 Mercer Slough (South Kelsey Creek) Basin Impacts

For the Mercer Slough (South Kelsey Creek) basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams by a wide margin (Table 5.1). However, Alternative 4 would create the most new impervious surface by a wide margin (Table 5.2). Alternative 4 would convert an additional 2.9 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 46 percent impervious cover. It should be noted that this is the highest proportion of new impervious surface among all basins and alternatives. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternatives 2, 3, and 4.

5.2.13 West Lake Sammamish Basin Impacts

For the West Lake Sammamish basin, Alternative 2 would cause the highest number of riparian encroachment within 300 feet of streams (Table 5.1). West Lake Sammamish is the only study-area basin for which Alternative 1 would create the most impervious surface (Table 5.2). Alternative 1 would convert 0.1 percent of the basin to impervious cover in addition to the No Action baseline condition of 40 percent impervious cover.

5.2.14 Coal Creek Basin Impacts

For Coal Creek basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams though it would do so in only three locations (Table 5.1). Alternative 2 would also create the most new impervious surface (Table 5.2). Alternative 2 would convert an additional 0.5 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 28 percent impervious cover.

5.2.15 May Creek Basin Impacts

For May Creek basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams, as well as the most new impervious surface by a wide margin (Tables 5.1 and 5.2). Alternative 2 would convert an additional 0.2 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 22 percent impervious cover. All of the proposed projects for all Alternatives lie within the Urban Growth Area portion of the basin.

5.2.16 Lower Cedar River Basin Impacts

For the lower Cedar River basin, Alternative 3 would cause the highest number of encroachment within 300 feet of streams and create the most new impervious surface (Tables 5.1 and 5.2). The percentage of impervious surface for the on-site portion of the Cedar River basin was not available for the existing conditions or the No Action baseline conditions. All of the proposed projects for all Alternatives lie within the Urban Growth Area portion of the basin.

5.2.17 Soos Creek Basin Impacts

For the Soos Creek basin, Alternatives 1, 2, and 3 would each add encroachment within 300 feet of streams at 4 locations (Table 5.1). Each would add 7.1 acres impervious surface, converting 0.1 percent of the on-site basin to impervious cover (Table 5.2). Soos Creek basin has the least developed baseline No Action condition of all the study-area basins, at 17 percent impervious cover.

5.2.18 Black River (Springbrook Creek) Basin Impacts

For the Black River (Springbrook Creek) basin, Alternative 2 would cause the highest number of encroachments within 300 feet of streams as well as the most new impervious surface (Table 5.1 and 5.2). Alternative 2 would convert an additional 1.0 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 44 percent impervious cover. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology in this basin could be substantially altered, including reduction in base flows, under Alternatives 2 and 4. These two Alternatives were also determined to adversely affect water quality, specifically temperature and heavy metals.

5.2.19 Lower Green River Basin Impacts

For the Green River basin, Alternative 4 would cause the highest number of encroachment within 300 feet of streams as well as the most new impervious surface (Tables 5.1 and 5.2). Alternative 4 would convert an additional 1.1 percent of the on-site basin to impervious cover in addition to the No Action baseline condition of 47 percent impervious cover.

5.3 Overall Study Area Comparison of Alternatives

5.3.1 Direct Impacts

The information summarized in Tables 5.1 and 5.2 clearly indicates that Alternative 1 has the least potential impact on fish populations and habitats, including threatened species. As discussed above, the chief indicator of habitat degradation for this scale of analysis is the creation of new impervious surface area. Alternative 1 would create half or less the amount of new impervious surface of any other Alternative, whether expressed as acreage or percent of basin. Alternative 1 also has the least new impervious area for every individual basin except for West Lake Sammamish and Kelsey basins, which have among the least intact fish habitat under baseline conditions, and Soos Creek basin, where Alternatives 1, 2, and 3 have equal and relatively minor impacts.

Table 5.1 shows that Alternative 1 would create substantially fewer riparian encroachments than other action alternatives. This indicates substantially less potential for direct construction impacts to fish habitats and populations.

Alternative 4 has the highest potential for operational direct impacts based on area-wide impervious surface creation. Alternative 4 would create substantially more new impervious cover than other action alternatives and more than double the new impervious surface compared to Alternative 1. In addition, Alternative 4 includes the only proposed activity outside the Urban Growth Area, an expansion of Highway 202 in the Sammamish River basin.

The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has determined that hydrology could be substantially altered in six basins under Alternative 4, three basins under Alternative 2, and one basin under Alternative 3. No substantial hydrology impacts are expected under Alternative 1 and No Action. Substantial water quality impacts are expected in one basin under Alternatives 2 and 4.

Alternative 2 would cause the most riparian encroachment, indicating the highest potential for construction impacts. In addition, Alternative 2 would create the most new impervious surface for several individual basins including Bear Creek basin, which retains among the most intact fish populations and habitat in the study area.

5.3.2 Secondary Effects

Secondary impacts are reasonably foreseeable effects of an action that occur later in time or are further removed in distance from the direct effects of the proposal. Generally, these effects are induced by the initial programmatic action. Programmatic secondary impacts are expected to be limited and unlikely for the I-405 Corridor Program for several reasons:

- All of the I-405 Corridor Program action alternatives are generally compatible with existing regional and local land use plans that have already addressed growth.

- A similar level of projected growth is expected to occur in the region, with or without the action alternatives.
- Transportation projects, similar to I-405, are frequently built in response to population and/or employment growth.
- The I-405 Corridor Program study area is experiencing a high rate of population growth and land development that is increasing travel demand and congestion.

Secondary effects may be more detectable during project-level environmental analysis. Therefore, the potential for secondary effects will be analyzed in the future project-level environmental analysis, documentation, and review.

5.3.3 Cumulative Effects

Background information related to land use and transportation provides the basis for evaluating cumulative effects for fish and aquatic habitat and is located in Appendix E of this expertise report.

5.3.3.1 Regulatory Trends

There has been a longstanding trend in Washington and the study area of increasing regulation of fish harvesting and habitat alteration. In 1949, the state legislature passed a law now known as the "Hydraulic Code" giving the WDFW jurisdiction over activities in or near state waters (RCW 75.20.100-160). Although the law has been amended occasionally since it was originally enacted, the basic authority has been retained.

The law requires that any person, organization, or government agency wishing to conduct any construction activity in or near state waters must do so under the terms of a permit called the Hydraulic Project Approval (HPA) issued by the WDFW. State waters include all marine waters and fresh waters of the state.

The Growth Management Act addresses the negative consequences of unprecedented population growth and suburban sprawl in Washington State. The GMA requires all cities and counties in the state to conduct planning for growth and protection of sensitive areas, and has more extensive requirements for the largest and fastest-growing counties and cities in the state. Its requirements include guaranteeing the consistency of transportation and capital facilities plans with land use plans. The GMA also required definition of Urban Growth Areas (UGAs) which would absorb increased population and economic growth, thus relieving environmental pressure on rural areas that contain the most viable fish habitat. Local regulations and policies established in response to the Act often include protection of stream and wetland salmon habitat.

In the 1980s and 1990s, all local municipal jurisdictions in the I-405 study area adopted some form of sensitive areas ordinance. These ordinances typically establish restrictions on disturbance of aquatic habitat including stream disturbance, wetland filling, and buffer encroachment.

The federal Endangered Species Act of 1973 (ESA) established a legal framework to protect species considered to be in danger of extirpation. There are two classifications under which a species may be listed.

- > Species determined to be in imminent danger of extinction throughout all of a substantial portion of their range are listed as "endangered."
- > Species determined likely to become endangered in the foreseeable future are listed as "threatened." (NOAA, 2000)

Two species occurring within the project area have been listed under the ESA: the Puget Sound chinook salmon was listed as threatened in 1999, and the bull trout was listed as threatened in 1998. The restrictions on "taking" these species, including damaging their habitat, have constrained development since that time. ESA review typically requires environmental effect assessment beyond what would otherwise be required, and may often result in project design or implementation modifications.

Under the 4d Rule of the ESA, specific protective regulations are established that limit certain activities deemed harmful to threatened or endangered species. Establishment of specific 4d Rules not only help protect species, but also can assist agencies and citizens in compliance with ESA by relieving them from species "take" liability when the rules are followed. In the study area, the "Tri-County Endangered Species Act Response" seeks to establish a broad range of 4d rules for road maintenance, stormwater control, and land management.

5.3.3.2 Fish Population Trends

Agencies including the NMFS and the WDFW have tracked population trends for anadromous salmonids. Although fish populations naturally fluctuate in response to factors such as climate variations, nearly all native salmonid populations in the region have undergone a severe declining trend since the human population began rapidly increasing over the past century.

Chinook salmon runs for the overall Puget Sound evolutionarily significant unit (ESU) have declined from the recorded peak of 690,000 fish in 1908, to the most recent average of approximately 160,000 fish, leading to the federal "threatened" listing for this species as described previously. The "threatened" Puget Sound chinook salmon ESU "species" is composed of over twenty chinook salmon "stocks" specific to various watersheds draining to Puget Sound. This includes the two stocks within the study area specific to the Cedar River/Lake Washington and Green River watersheds.

The Cedar River/Lake Washington chinook salmon stocks are at or near historic minimums. An escapement (number of fish returning to spawn annually) goal of 1,200 fish was established by the WDFW based on historic escapement data. This goal has been met only three times since 1973, and the 1997 escapement was only 227 fish, or one-sixth of the goal (NMFS, 2000).

The Green River summer/fall chinook population is composed of both naturally spawning fish and hatchery production. Naturally spawning fish include both wild, native salmon and "strays" from hatchery stock. The downward population trend typical of many Puget Sound stocks is not apparent for Green River stocks. The escapement goal had been set at

5,800 fish in the 1970s. Annual spawning escapement (number of fish returning to spawn) has averaged about 5,700 fish during 1968-1977, and 7,280 fish during 1988-1997 (WRIA 9, 2001).

The Washington State Salmonid Stock Inventory (WDFW, 1992) identifies five salmonid stocks within the study area as "depressed": Cedar River sockeye, Lake Washington beach sockeye, Lake Washington/Sammamish tributary sockeye, Lake Washington/Sammamish tributary coho, and Lake Washington winter steelhead. A depressed stock is defined as "one whose production is below expected levels, based on available habitat and natural variation in survival rates, but above where permanent damage is likely." Escapement for each of these stocks is on a declining trend (WDFW, 1992). Any cumulative adverse effects of the I-405 Corridor Program projects would be likely to contribute to such declining trends.

5.3.3.3 Cumulative Effects of I-405 Corridor Program Alternatives

In comparing the I-405 Corridor Program alternatives, the No Action Alternative scenario is identical to the baseline conditions for the study area. This is because the baseline conditions do not reflect current conditions, but instead assume completion of currently committed projects.

Based on these estimates, planned growth in human populations and land use development will undoubtedly increase the likelihood of substantial unavoidable adverse cumulative effects to fish habitat and populations. Transportation programs included in *Destination 2030*, including I-405, I-5, and Trans-Lake Washington programs, are expected to increase pressure for growth along major transportation corridors within the UGA, thus relieving pressure and reducing adverse effects on the rural areas that contain the most functional fish habitat. All of the action alternatives for the I-405 Corridor Program would influence pressure for growth in this manner. However, since the proposed I-405 Corridor Program improvements are only a portion of the overall MTP, the differences among the I-405 action alternatives would not alter the overall cumulative effect of the MTP and planned growth and development to a meaningful degree.

One quantitative way to compare potential cumulative effects among alternatives is to compare each alternative's share of the projected total new impervious surface created. As described previously, new impervious surface is the most reliable predictor of aquatic habitat degradation. By this measure, Alternative 4 would have the greatest cumulative effect, creating 24 percent of new roadway miles in the study area. Alternatives 2 and 3 would have much lower levels of cumulative effects, creating 13 percent and 16 percent of new roadway miles, respectively. Alternative 1 would have the lowest impact, creating 4 percent of new roadway miles.

In contrast, the No Action Alternative (baseline condition) would result in the continuation of pressure for growth in rural areas or at the fringe of the UGA. If allowed to occur by local land use regulatory agencies, that pattern of growth would have the potential to shift effects on fish and aquatic habitat from inside the UGA to outside the UGA or from more urbanized areas within the study area to the less developed fringe portions of the UGA. Under the No Action Alternative, future growth in employment and households and resulting development is forecast to be concentrated in Seattle, southwest Snohomish County, Tukwila, Federal Way, Woodinville, and Bothell. While the first four of these areas are nearer build-out, cumulative effects may pose a threat to fish and aquatic habitat, particularly in the southwest Snohomish County and Woodinville areas.

None of the action alternatives would contribute substantially to altering the negative trends in salmon populations discussed in Section 5.3.3.2. After several tens of thousands of years of sustained viability through natural fluctuations, the recent sharp downward trend in salmon populations has corresponded to the rapid increase in human population. The high rate of population growth has driven all of the acute adverse impact mechanisms in the study area and the Puget Sound ESU, including, most notably, habitat alteration. Because the human population of the Puget Sound ESU is expected to increase by well over one million in the next 30 years, reverses in the decline of salmonid populations cannot reliably be assumed, regardless of which I-405 Corridor Program alternative is implemented.

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6. MITIGATION MEASURES

6.1 Construction Impact Mitigation

A number of BMPs could be employed during construction of each specific project to reduce the potential for adverse stream impacts during construction of various projects. BMPs would be dictated by WDFW for any project involving work within stream channels or other water bodies. Most potential construction impacts could be largely avoided simply by limiting clearing and grading to the typical dry season from approximately April through September (CH2M HILL, 2001). Other useful BMPs may include mulching, hydroseeding, matting or covering graded areas during wet weather, installation of filter fences and other erosion control measures, and detention/treatment of stormwater runoff from construction sites. In addition, erosion control measures should be inspected on a regular basis throughout construction.

The potential for toxic pollution could be controlled by requiring that all equipment be maintained and refueled on impervious surfaces where potential spills and storm-water runoff can be contained. A toxic spill response plan would be designed in order to contain any spills that occur. Water quality monitoring programs could also be designed to sample above and below construction areas, before, during and after project construction.

6.2 Operational Impact Mitigation

Avoiding impact is the most effective mitigation strategy and can be addressed first by alternative selection and later in the design of specific projects. Unavoidable impacts should be minimized and/or compensated during design of specific projects. The design of individual projects under any action alternative should minimize in-stream structures or disturbance as well as riparian vegetation disturbance.

Controlling storm-water runoff according to the Stormwater Management Manual for Western Washington (Ecology, 2000) or the most current revision of that document will minimize water quantity and quality impacts of the proposed project. Detention and/or infiltration ponds should be employed to control storm-water runoff in order to improve water quality and attenuate peak flow discharges. Storm-water facilities should be designed in accordance with local regulations, which generally require that peak hourly storm-water flows be held to or below pre-development levels. This minimizes erosion and sedimentation resulting from increased peak flows. The *I-405 Corridor Program Draft Surface Water Resources Expertise Report* (CH2M HILL, 2001) has recommended infiltration of stormwater in specific areas with suitable geology. This would not only control excessive peak flows, but would potentially recharge base flow groundwater sources that sustain fish habitat during the dry season.

Road runoff should be collected and treated according to the Stormwater Management Manual for Western Washington in order to meet the water quality standards set by those agencies.



6.3 Compensatory Mitigation

Identification of compensatory mitigation locations and concepts has begun, and is presented in the *Fish Summary and Mitigation Report*. State and local agencies were contacted to identify fish habitat mitigation priorities and existing mitigation projects. This information will be used to focus I-405 mitigation efforts most effectively within each impacted basin, as the individual projects are designed and implemented.

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APPENDIX A

Major Elements of Alternatives

Appendix A

I-405 CORRIDOR PROGRAM

MAJOR ELEMENTS OF ALTERNATIVES

1. TRANSPORTATION DEMAND MANAGEMENT

TDM Package Core Assumptions

- Existing TDM programs will continue (public & private sector)
- Existing public TDM programs will be expanded to meet new market demand
- Implementation of trip reduction targets will be supported by new interlocal or sub-regional agreements
- Strategies are flexible, monitored and adjusted as needed over time (includes tracking trends for Internet, e-commerce)
- Funding is provided for demonstration projects, plus some ongoing funding for new TDM strategies found effective

Focus of TDM Package

SOV and other trip reduction through the use of:

- Incentives
- Increasing access to alternative modes
- Public information, education and promotion
- Land use strategies

Strategies in the TDM Package
<u>VANPOOLING</u> <ul style="list-style-type: none">• Maximize vanpooling in the corridor (minimum of a five-fold increase)<ul style="list-style-type: none">* Intensive marketing of vanpooling, including start-up subsidies* Use of new “value-added” incentives (e.g., frequent flyer miles for vanpoolers)* Creation of a revolving no-interest loan fund for purchasing vans* 50% fare subsidy* Provide sufficient infrastructure (e.g., small park & ride lots)* Owner-operated vanpool promotion
<u>PUBLIC INFORMATION, EDUCATION & PROMOTION PROGRAMS</u> <ul style="list-style-type: none">• Establish ongoing public education and awareness program specific to the corridor (focus on issues and transportation alternatives)• Provide traveler information system(s), including interactive ridematch and transit information• Provide personalized trip planning assistance, including for transit

Strategies in the TDM Package

EMPLOYER-BASED PROGRAMS

- Increase work choices
 - Telecommuting, flextime, compressed work schedules, multiple shifts
 - Proximate commuting (assigning employees to work sites close to home)
 - Incentives to employers to offer work choices (e.g., tax credits)
- For current commuter trip reduction program – new incentives and resources to help CTR-affected employers obtain CTR goals (e.g., grants, tax credits, staff support)
- Expanded CTR-like program aimed at smaller employers plus those larger ones not affected by CTR laws (non-regulatory, voluntary based)
- Support development and core operations of transportation management associations (TMA)
- Parking cash-out program incentives and financing

LAND USE AS TDM

Compact, mixed-use, non-motorized and transit friendly (re)development in target areas (urban centers, suburban clusters, key arterials, transit station areas, transit centers, park-and-ride lots)

- Transit-oriented development (TOD)
- Code changes, streamlining processes, local connectivity retrofitting projects to support (re)development
- Programs (code assistance, design review support) to help jurisdictions and developers implement compact (re)development
- New parking management programs

OTHER MISCELLANEOUS TDM PROGRAMS

Innovative transit and vanpool fare media, incentives, demonstrations, matching funds, etc. [e.g., area-wide “Smart Card” (FlexPass) programs for Eastgate, downtown Bellevue, north Renton industrial area, Bothell business parks, Redmond, downtown Kirkland, Tukwila]

- Non-commute trips TDM programs (research and demonstrations)
- Other miscellaneous incentives (local and state tax credit programs, developer incentives)

2. EXPANDED TDM PACKAGE

Overview

This major element will include the range of regional pricing actions being evaluated by the PSRC. The potential impacts of the following actions will be examined in the context of the I-405 Corridor:

- ◆ Region-wide congestion pricing (RCP);
- ◆ Fuel taxes (revenue = RCP);
- ◆ Fuel taxes (revenue = 50% RCP);

- ◆ Mileage charge (revenue = RCP);
- ◆ Parking charges;
- ◆ High occupancy toll lanes.

2. NEW TRANSIT EXPANSION BY 50% WITHIN STUDY AREA

Transit service levels would be increased by 25% compared to the current King County 6-year plan, assumed to be in place by 2007.

Transit service levels would be increased by 50% compared to the current King County 6-year plan, assumed to be in place by 2007.

3. DOUBLE TRANSIT SERVICE WITHIN STUDY AREA

Overview

Transit service levels would be doubled compared to the current King County 6-year plan, assumed to be in place by 2007. The effects of I-695 on short-term transit service have not been assumed. Transit service coverage and design would also be revised to more closely match travel patterns within the study area. These revisions could include more center-to-center movements, connections between neighborhoods and centers, and development of an appropriate 'grid' transit system within the study area.

4. PHYSICALLY SEPARATED HIGH-CAPACITY TRANSIT (HCT)

Description

A high-capacity transit solution would be designed for the I-405 corridor. The exact technology of this solution would be determined in later studies, but could include busway, light rail, monorail, or similar mode that could operate at speeds of up to 70 mph. The HCT alignment would generally follow the I-405, SR 520 and I-90 freeway corridors in existing freeway, arterial, or railroad right-of-way. The key characteristic of this solution would be that it would have a dedicated alignment, removing it from congestion-induced delays. Bus service would be reconfigured to provide maximum accessibility to the HCT system.

Alternatives 1 and 2 assume a full-scale HCT within the corridor, likely using some form of rail technology. Alternative 3 assumes a bus rapid transit (BRT) concept, building on the existing freeway HOV system.

High Capacity Transit		
Jurisdiction	Project ID*	Projects
Tukwila & Renton	T.HCT-1	HCT- SeaTac to Renton CBD
Renton	T.HCT-2	HCT-Renton CBD to NE 44 th (Port Quendall)
Renton, Newcastle & Bellevue	T.HCT-3	HCT- NE 44 th (Port Quendall) to Factoria
Bell & Issaquah	T.HCT-4	HCT – Factoria to Issaquah

High Capacity Transit		
Bellevue	T.HCT-5	HCT – Factoria to Downtown Bellevue
Bell & Redmond	T.HCT-6	HCT – Bellevue to Redmond
Bell & Kirkland	T.HCT-7	HCT – Bellevue to Totem Lake
Kirk, King Co. & Woodinville	T.HCT-8	HCT – Totem Lake to Bothell
Bothell & Sno Co.	T.HCT-9	HCT – Bothell to Lynnwood

High Capacity Transit Stations	
Sea-Tac	Sea-Tac
Tukwila	Southcenter
Tukwila & Renton	Tukwila (Longacres)
Renton	Downtown Renton
Renton	North Renton
Renton	Port Quendall
Bellevue	Factoria
Bellevue	Bellevue Transit Center
Bellevue	Bellevue Library
Bell & Kirk	SR 520/Northup Way
Kirkland	Downtown Kirkland (NE 85 th Street)
Kirkland	Totem Lake
Woodinville	NE 145 th Street
Woodinville	Woodinville
Bothell	NE 195 th Street
Bothell	Canyon Park
Snohomish County	164 th Street SW (Ash Way)
Bellevue	Eastgate
Bellevue	Lakemont
Issaquah	Issaquah
Bellevue	132 nd Avenue NE
Bellevue	148 th Avenue NE
Redmond	Overlake (NE 40 th Street)
Redmond	Redmond/Town Center
Redmond	Bear Creek
Mercer Island	Mercer Island

6. ADD ARTERIAL HOV AND TRANSIT PRIORITY

Overview

Create lanes, intersection queue jumps and signals that provide priority to HOVs and transit on major arterials in the study area.

Arterial HOV		
Bellevue	R.HOV-36	Coal Creek Pkwy I-405 to Forest Drive
Bellevue	R.HOV-37	NE 8th Street I-405 to 120th Ave NE
Kirkland, Redmond	R.HOV-38	NE 85th St Kirkland Way to 148th Ave NE
Kirkland	R.HOV-39	NE 116th 98th Ave NE to 124th Ave NE
Kirkland	R.HOV-40	NE 124th 100th Ave NE to 132 Ave NE
Bothell	R.HOV-41	SR 527 From SE 228th St to SR 524
Renton	R.HOV-43	SR 169 - SR 405 to Riverview Park vicinity - HOV/Transit Preferential treatment.
Renton	R.HOV-44	SW 27th St Corridor in Renton - Oaksdale Ave to SR 167
Redmond	R.HOV-47	Avondale Rd from Novelty Hill Road to Avondale Way Construct SB HOV lane
Renton, King Co	R.HOV-48	SW 43 St (SR 167 to 140 Ave SE)
Renton	R.HOV-49	Logan Ave N / N 6 St (S 3 St to Park Dr)
Renton	R.HOV-51	Park Dr - Sunset Blvd (Garden Ave to Duvall Ave NE)
Kenmore	R.HOV-53	68 Ave NE (Smds Rd to SR 522) - Construct NB HOV lane
Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)
Kirkland, Bell	R.HOV-56	Lake Wa Blvd (SR 520 to Yarrow Bay) - SB HOV lane
Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-4405 Vicinity) – Que Bypass
Bellevue	R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride

7. HOV EXPRESS ON I-405 WITH DIRECT ACCESS RAMPS

Overview

Complete the series of ramps connecting arterials and freeways directly to HOV lanes on I-405. This allows carpools, vanpools and buses to use the HOV lanes without weaving across other traffic. HOV direct access ramps have already been designed by Sound Transit in downtown Bellevue and Kirkland, and design studies are starting for HOV ramps in downtown Renton.

HOV Interchange Ramps (Direct Access)		
Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,
Renton	R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,
Bellevue	R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,
Bellevue	R.HOV-28	SR 520 Fwy to Fwy HOV ramps,
Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps
Sno. Co.	R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.
Kirkland	R.HOV-61	NE 85th
ST	R.HOV-101	I-405 @ Lind – HOV Direct Access
Newcastle	R:HOV-65	112th St SE (In-Line Station)

Committed HOV Projects		
Bellevue	HOV-01	I-405 at NE 4th/6th/8th (Bellevue)/Construct new HOV direct access at NE 6th, Improve arterial capacity at NE 4th/8th interchanges
Bellevue	HOV-02	I-90 (Eastgate)/New I-90 HOV direct access connection to P&R
Renton	R.HOV-32	Between Sunset and SR-900 /Park Ave interchange in Renton
ST	R:HOV-66	I-405 at 128th St/HOV direct access improvements
Renton	R.HOV-33	NE 44th I/C - HOV Direct Access and Arterial Improvements(Assumes Port Quendall)
WSDOT	HOV-14	I-405 (I-5 Swamp Creek to SR 527)/Construct NB and SB HOV lanes total 6 lanes
Bothell	R.HOV-62	SR 522 Campus Access
Bothell	R.HOV-63	SR 527 Flyer Stop
ST	HOV-102	Woodinville Arterial Enhancements/HOV arterial enhancements

8. ADD PARK-AND-RIDE CAPACITY TO MEET DEMAND

Overview

Provides additional park-and-ride capacity at existing locations and creates selected new lots based on forecasted transit and carpool demand. The locations initially identified for expansion are listed below. These locations will be refined during the evaluation process.

Park and Rides		
Renton	T.PR-3	Renton East Highlands new Park and Ride
Tukwila & Renton	T.PR-6	Tukwila Commuter Rail (Longacres)
King County	T.PR-5	140th Ave SE and Petrovitsky Rd Vicinity
King County	T.PR-8	SR 169 and 140th WY SE
King County	T.PR-9	Petrovitsky Rd and 157th Ave SE
King County	T.PR-10	140th Ave SE and SE 192nd
King County	T.PR-11	SR 515 and SE 208th
Kent & Renton	T.PR-12	SR 167 and SW 43rd
Kent & Renton	T.PR-13	SR 167 and 84th Ave
Redmond	T.PR-17	Willows Rd @ NE 100th
Redmond	T.PR-18	SR 202 @ NE 100th
Bellevue & Kirkland	T.PR-20	South Kirkland
Redmond	T.PR-21	Overlake
Bellevue	T.PR-22	South Bellevue
Bellevue	T.PR-23	Newport (112 th Ave. SE)
King County	T.PR-24	NE 160th/Brickyard Rd
Bothell	T.PR-25	Canyon Park (I-405 and SR 527)
Tukwila	T.PR-30	Tukwila
Kirkland	T.PR-31	Houghton
Kirkland	T.PR-32	Kingsgate
Medina	T.PR-33	Evergreen Point
Bellevue	T.PR-34	Wilburton
King County	T.PR-35	Lakemont
Redmond	T.PR-36	Redmond
Redmond	T.PR-37	Bear Creek
Bothell	T.PR-38	Bothell
Kenmore	T.PR-39	Northshore
Kenmore	T.PR-40	Kenmore
Woodinville	T.PR-41	Woodinville
Mercer Island	T.PR-42	Mercer Island
Bellevue	T.PR-43	Eastgate

9. ADD TRANSIT CENTER CAPACITY TO MEET DEMAND

Overview

Expand existing transit centers and create new transit centers to accommodate increased transit service. The specific locations for expansion and new centers will be identified during the evaluation process. Alternatives 1, 2, and 3 will require transit center capacity to accommodate a significant increase in transit service, at designated HCT stations, and at feeder bus connections. A partial listing is below.

Transit Center Capacity		
Renton	T.TC-6	Downtown Renton
Bellevue	T.TC-8	Downtown Bellevue
Redmond	T.TC-9	Overlake
Redmond	T.TC-10	Redmond/Town Center
Kirkland	T.TC-12	Downtown Kirkland
Kirkland	T.TC-14	Totem Lake

10. BASIC I-405 IMPROVEMENTS

Overview

This major element fixes existing bottlenecks and locations with safety deficiencies along I-405.

Basic I-405 Improvement Projects		
Jurisdiction	Project ID*	Projects
Renton	R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167
Kirkland	R.BI.2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th
Kirkland	R.BI.3	SB auxiliary Lane NE 124th to NE 85th
Bellevue	R.BI.4	I-90 / Coal Creek Interchange
Bothell, King Co, Kirkland	R.BI.5	SB SR 522 to 124th continue climbing lane as an auxiliary lane
Bothell	R.BI.6	NB auxiliary lane SR 522 to SR 527
Renton	R.BI.7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th
Bellevue	R.BI.8	I-90 to Bellevue SB HOV direct connection to I-90 west
Bellevue	R.BI.9	NB auxiliary lane I-90 to NE 8th
Bellevue	R.BI.10	Increase SR 405 to Eastbound SR 520 Ramp capacity
Renton	R.BI.14	NB Auxiliary Lane I-5 to SR 167
Various	R.FR-24	Improve interchange geometrics at all major truck routes (WB-20 Design Criteria)
WSDOT	R-55	I-405/SR 167 Interchange/Construct new southbound I-405-to-southbound SR 167 ramp modification.

11. ADD 2 GENERAL PURPOSE LANES EACH DIRECTION ON I-405

Add up to 2 general purpose lanes to I-405 through widening of the existing freeway. A design option is to create collector-distributor lanes in selected corridor segments (See Element 12).

12. PROVIDE COLLECTOR DISTRIBUTOR LANES ON I-405

Overview

Collector- Distributor lanes provide more time for traffic to safely enter or exit from roadway by providing lanes removed from general travel. This is being considered as a design option to handle the addition of one or two general purpose lanes in each direction along I-405 in certain sections. Collector-Distributor lanes have been included as parts of other elements.

13. ADD TWO EXPRESS LANES EACH DIRECTION ON I-405

Overview

This element consists of a four-lane express facility designed to operate with limited interchanges along the length of I-405. The express lanes would be physically separated from the rest of I-405 through the use of barriers. Certain segments could operate within the median of I-405, while other segments would need to be elevated, in tunnel, or on separate alignments.

The express lanes could operate as a general purpose facility or as a managed facility, such as a 'High Occupancy Toll (i.e. HOT) lane. Certain users could be allowed to use the express lanes for free, while other users could be allowed to 'buy-in' to available capacity. The capacity would be priced depending upon demand.

Express Lanes – 2 Lanes each Direction between Major Interchanges		
Jurisdiction	Project ID	Projects
Tukwila, Renton	R.TC-20	Add Express lanes - SR 5 Tukwila to SR 167
Renton	R.TC-21	Add Express lanes - SR 167 to SR 900 north Renton I/C
Renton, Newcastle, Bellevue	R.TC-22	Add Express lanes -SR 900 North Renton I/C to SR 90
Bellevue	R.TC-23	Add Express lanes - SR 90 to SR 520
Bellevue, Kirkland	R.TC-24	Add Express lanes - SR 520 to NE 70th
Kirkland	R.TC-25	Add Express lanes - NE 70th to NE 124th
Kirkland, King County, Bothell	R.TC-26	Add Express lanes - NE 124th to SR 522
Bothell	R.TC-27	Add Express lanes - SR 522 to SR 527
Bothell and Snohomish Co.	R.TC-29	SR 527 to vicinity of Damson Road
Renton	R.TC-28	Add Express lanes- on SR 167 north of 180th up to I-405

Express Lanes –Access Locations		
Snohomish Co	R.TC-30	Northern end to Express lanes - Between SR 527 and I-5
King Co/Kirkland	R.TC-31	Slip Ramp- South of NE 160th St
Kirkland	R.TC-32	Slip Ramp- South of NE 70th St
Bellevue, Newcastle	R.TC-33	Slip Ramp- South of Coal Creek Pkwy
Renton	R.TC-34	Interchange access location- SR 167

14. WIDEN SR 167 BY 1 LANE EACH DIRECTION TO KENT (STUDY AREA BOUNDARY)

Overview

SR 167 would be widened by one lane in each direction to accommodate additional demands due to growing demands and the effects of improvements at the I-405/SR 167 interchange. The widening is assumed to extend at least to the study area boundary in Kent. Alternative 3 will consider the potential to add a total of two lanes in each direction to SR 167 within 1 mile of I-405, due to the substantial capacity additions assumed for I-405. This element does not presume that SR 167 would be redesignated as I-405, although each of these improvements would be compatible with such a redesignation if it occurs.

16. IMPROVE CONNECTING FREEWAY CAPACITY TO I-405

Overview

Enhance the capacity of connecting freeways by one lane in each direction (for a distance of approximately ½ to 1 mile on both sides of I-405) to avoid bottlenecks at the connections to I-405.

Connecting Freeway Capacity (One Lane, Each Direction)		
Jurisdiction	Project ID	Projects
Tukwila	R.CF.1	SR 518 I-405 to SR 99/Airport Access
Bellevue	R.CF.3	I-90 South Bellevue to Eastgate
Bellevue	R.CF.4	SR 520 Bellevue Way to 148 th Avenue NE
Bothell, Woodinville	R.CF.5	SR 522 Bothell to NE 195th
Snohomish Co, Lynnwood	R.CF.6	SR 525 I-405 to SR 99
Renton, Kent	R.CF.8	SR 167 I-405 to Study Area Boundary
Tukwila	R.CF.9	I-5 at Tukwila
Lynnwood	R.CF.10	I-5 at Swamp Creek – 196 th to 164 th

17. IMPLEMENT PLANNED ARTERIAL IMPROVEMENTS

Overview

This major element involves the implementation of several arterial improvements called for in local agency plans and the Eastside Transportation Program (ETP). The ETP has been an ongoing process by regional, county and local governments to coordinate transportation planning and funding in East King County. Many of the ETP projects have already been examined in detail by the agencies involved and have been determined to be effective in addressing a variety of transportation issues.

Eastside Transportation Projects - Committed Projects		
Jurisdiction	Project ID	Projects
Bellevue	R-08	NE 29th PI (148th Ave NE to NE 24th St)/Construct new 2-lane road
Bellevue	R-101	150th Ave SE---Widen to 7 lanes from SE 36th to SE 38th; add turn lanes
KCDOT	R-40	Juanita-Woodinville Way (NE 145 St to 112th Ave NE) Widen to 5 lanes + CGS, walkway/pathway
KCDOT	R-47	NE 124 St (Willows Rd to SR 202)--- Widen to 4/5 lanes + CGS, bike facilities; traffic signal.
Kirkland	R-21	NE 120 St (Slater Ave to 124 Ave NE)--- Construct new 3-lane roadway with ped/bike facilities
Redmond	R-111	Willows Rd Corridor Improvements-- Channelization of Willows Rd/Redmond Way intersection and widening of Willows Rd from NE 116th to NE 124th
Redmond	R-26	NE 90 St (Willows Rd to SR 202)--- Construct new 4/5 lanes + bike facilities
Redmond	R-28	West Lake Sammamish Parkway (Leary Way to Bel-Red Rd)--- Widen to 4/5 lanes + CGS, bike lanes
Renton	R-36	Oakesdale Ave SW (SW 31st to SW 16th)--- Construct new 5 lane roadway with CGS
Snohomish Co.	R-10	SR 524 (24 St SW to SR 527)--- Widen to 4/5 lanes including sidewalks, bike lanes
Snohomish Co.	R-117	39th Ave SE Realignment at SR 524 and York Rd--- Construct 4-way intersection to replace 2 offset intersections
Bothell, Snohomish Co.	R.AC-21	120th NE/39th SE - NE 95th to Maltby Rd - 4/5 lanes including new connection
Woodinville	R-51	Woodinville-Snohomish Rd/140 Ave NE (NE 175 St to SR 522)--- Widen to 4/5 lanes + CGS, bike lanes
Woodinville/WSDOT	R-25	SR 202 Corridor Improvements(East Lake Sammamish Pkwy to Sahalee Way)--- Widen to 3/5 lanes; intersection improvements with bike/ped facilities
KCDOT	R-39	140 Ave SE (SR 169 to SE 208 St)--- Widen to 5 lanes SR 169 to SE 196 St, widen for turn channels on SE 196. Combines 2 King County CIP projects. A major North-South arterial which serves the Soos Creek Plateau and Fairwood.

Eastside Transportation Projects - Planned Projects		
Jurisdiction	ETP #	Projects
Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)
Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety improvements, consolidated driveways & left turn lanes; and sidewalks. (ETP R-107)
Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)
KCDOT	R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential treatment, turn channels. (ETP R-46)
KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)
KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)--- Construct new 3 lane arterial with CGS, bike lanes (ETP 61)
Kenmore/KCDOT	R.PA-11	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22)
Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)---- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with ped/bike facilities (ETP R-23)
Kirkland	R.PA-13	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124)
Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP 309)
Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-24)
Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor – BROTS; (ETP R-112)
Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen Bear Creek Pkwy (ETP R-110)
Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)
Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)
Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS (ETP R-35)
Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation (ETP R-33)

Eastside Transportation Projects - Planned Projects		
Renton	R.PA-22	SW Grady Way (SR 167 to SR 515)-- Rechannelize and modify signals for a continuous eastbound lane (ETP R-37)
Renton	R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)
Renton/ KCDOT	R.PA-24	Soos Creek Regional Links --- Placeholder for Trans-Valley Study (ETP R-115)
Woodinville	R.PA-25	SR 522 Interchange Package(SR 522/SR 202 &SR522/195th St)-- Access improvements and new freeway ramps (ETP R-53) (See R.AC-30)
Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)
WSDOT	R.PA-27	SR 520/SR 202 Interchange-- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520 (ETP R-29)
WSDOT	R.PA-28	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)

18. EXPAND CAPACITY ON NORTH-SOUTH ARTERIALS

Overview

This element expands arterial capacity to provide connected north-south travel. This element would facilitate vehicular movement without requiring as many trips along I-405.

North-South Arterial Projects		
King Co	R.AC-2	138th Ave - Petrovitsky Rd to SR 169- Add 1 lane
King Co, Renton	R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St
Redmond	R.AC-15	Willows Rd- NE 90th St to NE 124th St- Add 1 lane each direction
King Co, Woodinville	R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes
Woodinville	R.AC-17	SR 202- NE 145th St to SR 522- widen to 5 lanes
Redmond, King County, Woodinville	R.AC-18	SR 202 - NE 90th to NE 145th
Bothell, Snohomish County, Mill Creek	R.AC-20	SR 527/Bothell Everett Hwy - SR 522 to SR 524 - Widen by 1 lane each direction
Bothell, Woodinville	R.AC-30	SR 202 connection across SR 522 to 120th
Tukwila	R.AC-35	SR 181- S 180th to S 200th
Tukwila	R.AC-36	SR 181- 144th to Strander Blvd.
Tukwila	R.AC-37	Southcenter Blvd - Tukwila Pky to Strander Blvd

19. UPGRADE ARTERIAL CONNECTIONS TO I-405

Overview

This element provides for upgrading arterial connections to I-405. These projects are intended to improve operations at on- and off-ramps as well as on the arterials themselves. An additional lane in each direction was assumed for these arterials, although further analysis may show that similar benefits could be achieved through selected intersection improvements in some cases.

Arterial Interchange Improvements (One Lane Each Direction)		
Jurisdiction	Project ID	Projects
Tukwila	R.IC-3	SR 181 West Valley Highway/ Interurban
Renton	R.IC-4	SR 169 Maple Valley Hwy SR 900 to NE 5th
Bellevue	R.IC-6	Coal Creek Pkwy I-405 to Factoria Blvd.
Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th
Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE
Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE
Kirkland	R.IC-26	NE 132nd - 113th to 124th Ave NE
Bothell	R.IC-11	SR 527-228th to SR 524
Kirkland, King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St
Bothell	R.IC-21	New SR 405 Interchange at 240th Street SE(Bothell)
Bothell	R.IC-24	NE 160th Street-112th Ave to Juanita/Woodinville Way

21. CORRIDOR PEDESTRIAN AND BICYCLE IMPROVEMENTS

Overview

Non-motorized improvements throughout the corridor provide needed connections between modes (e.g. pedestrian overpasses from park and rides to freeway bus stops) and allow for commutes or trips to be made by walking or biking. Alternative 3 will exclude all of the ‘long-distance’ trails (identified below under the heading Pedestrian/Bicycle Connections) from this element. These improvements need further refinement in the context of other major elements in the alternatives.

Pedestrian/Bicycle (I-405 Crossings)		
Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks
Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility
King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder
King County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder
Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder
Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved shoulder
Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add ped/bike over-crossing of I-405
Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility

Pedestrian/Bicycle Connections		
Bellevue	NM.P&B-4	Lake Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities
Bellevue, Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.
Bellevue, Newcastle, Renton	NM.P&B-6	Lake Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility
Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.
Renton	NM. P&B 14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities (ETP NM-17)
Renton	NM. P&B 15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike facilities (ETP NM-15)
Renton	NM. P&B 16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities
Renton	NM. P&B 17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection
Renton/Tukwila	NM. P&B 18	I-405/I-5 - via or around I-405/I-5 interchange - Add ped/bike facilities
Tukwila	NM. P&B 19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes

22. I-405 CORRIDOR INTELLIGENT TRANSPORTATION SYSTEM ENHANCEMENTS

Overview

This major element provides ITS enhancements to facilitate more reliable traffic flow.

I-405 Corridor ITS Enhancements		
Jurisdiction	Project ID	Projects
Various	ITS.1	Add Camera Coverage to decrease TMC blind spots
Various	ITS.2	Complete Ramp Metering
Various	ITS.4	Dual Lane Ramp Metering
Various	ITS.5	Increased Incident Response
Various	ITS.6	Traffic adaptive control on arterials
Various	ITS.7	TIS before all major decision points
Various	ITS.8	WSDOT support of in-vehicle traffic information
Various	ITS.9	Arterial camera coverage

23. I-405 CORRIDOR FREIGHT ENHANCEMENTS

Overview

This major element focuses on improvements specific to freight movements. Note that freight will benefit as well from general purpose traffic expansion described in other elements.

I-405 Corridor Freight Enhancements		
Jurisdiction	Project ID	Projects
Renton	R.FR-10	Modify SR 167 Interchange for East to South Freight movements
Various	R.FR-11	Improve truck flow with ITS
Various	R.FR-23	Remote area for overnight freight parking and staging for early morning deliveries
Various	R.FR-26	Full depth shoulders for truck usage on key freeways and arterials)
Various	R.FR-27	Traveler Information System (TIS) on SR 167 for I-405 "options"
Various	R.FR-28	TIS on I-5 for SR 18/I-90; and 164th to I-405; and South 200th to I-405
Various	R.FR-29	Centralized fax/radio for real time congestion reporting for dispatchers and truck drivers. Leverage WSDOT video linkages (e.g., a "T-911" number).
Various	R.FR-30	Hours of operation and service periods optimized—"JIT" redefined for applicable service sectors (e.g. restaurants)
Various	R.FR-32	Light cargo delivery using Sound Transit service

APPENDIX B
Alternatives Project Matrix

APPENDIX B
I-405 Corridor Program EIS Alternatives Project Matrix

				Alternatives				
		Jurisdiction	ACTIONS	5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
10.	Basic I-405 Improvement Projects							
	Renton	R.BI-1 & R.FR-10	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167		✓	✓	✓	✓
	Kirkland	R.BI-2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th		✓	✓		✓
	Kirkland	R.BI-3	SB auxiliary Lane NE 124th to NE 85th		✓	✓		✓
	Bellevue	R.BI-4	I-90 / Coal Creek Interchange		✓	✓	✓	✓
	Both, King Co, Kirk	R.BI-5	SB SR 522 to 124th continue climbing lane as an auxiliary lane		✓	✓		✓
	Bothell	R.BI-6	NB auxiliary lane SR 522 to SR 527		✓	✓		✓
	Renton	R.BI-7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th		✓	✓		✓
	Bellevue	R.BI-8	I-90 to Bellevue SB HOV direct connection to I-90 west		✓	✓		✓
	Bellevue	R.BI-9	NB auxiliary lane I-90 to NE 8th		✓	✓		✓
	Bellevue	R.BI-10	Increase SR 405 to Eastbound SR 520 Ramp capacity		✓	✓		✓
	Renton	R.BI-14	NB Auxiliary Lane I-5 to SR 167		✓	✓		✓
	Various	R.FR.24	Improve interchange geometrics at all major truck routes (WB-20 Design Criteria)		✓	✓	✓	✓
10.	Committed Freeway Projects							
	Joint	R-17 & R-17(17)	I-90/SR 900 Interchange and SR 900 improvements/Interchange reconfiguration Outside of Study Area					
	Joint	R-19	I-90/Sunset Way Interchange/Complete interchange and upgrade nonmotorized connections. Outside of Study Area					
	WSDOT	R-55	I-405/SR 167 Interchange/Construct new southbound I-405-to-southbound SR 167 ramp modification.	✓	✓	✓	✓	✓
	SR 405 Through Capacity (TC)							
11.	Two additional GP lanes in each direction							
	Tukwila, Renton	R.TC-1	Two additional GP lanes in each direction - SR 5 Tukwila to SR 167				✓	
	Renton	R.TC-2	Two additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C				✓	
	Renton, Nwcas, Bel	R.TC-3	Two additional GP lanes in each direction - SR 900/North Renton I/C to SR 90				✓	
	Bellevue	R.TC-4	Two additional GP lanes in each direction - SR 90 To SR 520				✓	
	Bellevue, Kirkland	R.TC-5	Two additional GP lanes in each direction - SR 520 to NE 70th				✓	
	Kirkland	R.TC-6	Two additional GP lanes in each direction - NE 70th to NE 124th				✓	
	Kirk, K C, Both	R.TC-7	Two additional GP lanes in each direction - NE 124th SR 522				✓	
	Bothell, Sno Co	R.TC-8	Two additional GP lanes in each direction - SR 522 to SR 527				✓	
	Sno Co	R.TC-9	Two additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek				✓	
13.	Express Lanes- 2 lanes each direction between major interchanges							
	Tukwila, Renton	R.TC-20 + R.TC-29a	Add Express lanes - SR 5 Tukwila to SR 167					✓
	Renton	R.TC-21	Add Express lanes - SR 167 to SR 900 North Renton					✓
	Ren, Nwcas, Bel	R.TC-22 + R.TC-33	Add Express lanes -SR 900 North Renton I/C to SR 90					✓
	Bellevue	R.TC-23	Add Express lanes - SR 90 to SR 520					✓
	Bellevue, Kirkland	R.TC-24 + R.TC-32	Add Express lanes - SR 520 to NE 70th					✓
	Kirkland	R.TC-25	Add Express lanes - NE 70th to NE 124th					✓
	Kirk, K C, Both	R.TC-26 + R.TC-31	Add Express lanes - NE 124th to SR 522					✓
	Bothell, Sno Co	R.TC-27	Add Express lanes - SR 522 to SR 527					✓
	Sno. Co	R.TC-29 + R.TC-30	Add Express Lanes - SR 527 to SR 5 Swamp Creek					✓
	Renton	R.TC-28	Add Express lanes- on SR 167 north of 180th up to I-405					✓

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APPENDIX B
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				Alternatives				
	Jurisdiction	ACTIONS		5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
13. Express Lanes - Access Locations								
	Tuk & Renton	R.TC-29a & R.TC-20	Southern end to Express lanes - Between SR 181 and SR 167					✓ *
	Snohomish Co	R.TC-30 & R.TC-29	Northern end to Express lanes - Between SR 527 and I-5					✓ *
	King Co,Kirkland	R.TC-31 & R.TC-26	Slip Ramp- South of NE 160th St					✓ *
	Kirkland	R.TC-32 & R.TC-24	Slip Ramp- South of NE 70th St					✓ *
	Bellevue, Newcastle	R.TC-33 & R.TC-22	Slip Ramp- South of Coal Creek Pkwy					✓ *
	Renton	R.TC-34	Interchange access location- SR 167					✓
14. Widen SR 167 by 1 lane each direction to study Area boundary								
	Renton, Kent	R.CF-8	SR 167 I-405 to Study Area Boundary			✓	✓	✓
14A. SR 167 / I-405 Interchange Improvements								
	Renton	R.FR-10 & R.BI-1	SR 167/I-405 Interchange Add Directional Ramps for major movements			✓ *	✓ *	✓ *
16. Connecting Freeway Capacity (Matched to fit I-405 Improvements)								
	Tukwila	R.CF-1	SR 518 I-405 to SR 99/Airport Access			✓	✓	✓
	Bellevue	R.CF-3	I-90 South Bellevue to Eastgate				✓	✓
	Bellevue	R.CF-4	SR 520 Bellevue Way to 148th					✓
	Bothell, Woodin	R.CF-5	SR 522 Bothell to NE 195th			✓	✓	✓
	Sno Co, Lynnwood	R.CF-6	SR 525 I-405 to SR 99			✓	✓	✓
	Tukwila	R.CF-9	I-5 at Tukwila			✓	✓	✓
	Lynnwood	R.CF-10	I-5 at Swamp Creek - 44th to 155th			✓	✓	✓
10A. One additional GP or Auxiliary lane in each direction								
	Tukwila,Renton	R.TC-9	One additional GP lanes in each direction - SR 5 Tukwila to SR 167			✓		✓
	Renton	R.TC-10	One additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C			✓		✓
	Ren, Nwcas,Bel	R.TC-11	One additional GP lanes in each direction - SR 900/North Renton I/C to SR 90			✓		✓
	Bellevue	R.TC-12	One additional GP lanes in each direction - SR 90 To SR 520			✓		✓
	Bellevue,Kirkland	R.TC-13	One additional GP lanes in each direction - SR 520 to NE 70th (Verify need for additional through capacity on this section)			✓		✓
	Kirkland	R.TC-14	One additional GP lanes in each direction - NE 70th to NE 124th			✓		✓
	Kirk,K C,Both	R.TC-15	One additional GP lanes in each direction - NE 124th SR 522			✓		✓
	Bothell,Sno Co	R.TC-16	One additional GP lanes in each direction - SR 522 to SR 527			✓		✓
	Sno. Co	R.TC-17	One additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek			✓		✓
18. Arterial Capacity (AC) Actions								
	King Co	R.AC-2 & R-39	138th Ave - Petrovitsky Rd to SR 169- Add 1 lane. See R-39					
	King Co, Renton	R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St				✓	✓
	Ren, Nwcas,Bel	R.AC-4	140th Ave/Coal Creek Pkwy- Widen to 6 lanes to I-405					
	Redmond	R.AC-15 & R-111	Willows Rd- NE 90th St to NE 124th St- Add 1 lane each direction					✓ *
	King Co,Woodin	R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes				✓	✓
	Woodinville	R.AC-17 & R.PA-28	SR 202- NE 145th St to SR 522- widen to 5 lanes				✓ *	✓ *
	Red,K C,Woodin	R.AC-18 & R.PA-28	SR 202 - NE 90th to NE 145th					✓ *
	Ren, K C, Issaqu	R.AC-19 & R.IC-5	SR 900 - SR 405 to Edmonds. Additional capacity is not needed					
	Both,S C,Mill Cr	R.AC-20	SR 527/Bothell Everett Hwy - SR 522 to SR 524 - Widen by 1 lane each direction					✓
	Both,Woodin	R.AC-30 & R.PA-25	SR 202 connection across SR 522 to 120th				✓ *	✓ *
	Bothell	R.AC-34	120th Ave NE - SR 522 to NE 195th (4 lns existing additional not needed)					

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	Jurisdiction	ACTIONS		5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
	Tukwila	R.AC-35	SR 181- S 180th to S 200th					✓
	Tukwila	R.AC-36& R.IC-3	SR 181- 144th to Strander Blvd.					✓ *
	Tukwila	R.AC-37	Southcenter Pky - Tukwila Pky to Strander Blvd					✓
19.	Arterial Interchange Improvements (Matched to fit I-405 Improvements)							
	Tukwila	R.IC-3 & R.AC-36	SR 181 West Valley Highway/ Interurban See R.AC-36			✓	✓	✓
	Renton	R.IC-4 & R.HOV-43	SR 169 Maple Valley Hwy SR 900 to NE 5th See R.HOV-43			✓ *	✓ *	✓
	Renton	R.IC-5 & R.AC-19	SR 900/ Park - Lake Washington Blvd to Edmonds. Additional capacity is not needed.					
	Bellevue	R.IC-6	Coal Creek Pkwy I-405 to Factoria Blvd.	✓	✓	✓	✓	✓
	Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th			✓	✓	✓
	Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE			✓	✓	✓
	Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE			✓	✓	✓
	Bothell	R.IC-11 & R.HOV-41	SR 527-228th to SR 524			✓	✓	✓
	Renton	R.IC-12 & R.HOV-33	Port Quendall overpass at SE 44th. See R.HOV-33					
	Kirk,King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St				✓	✓
	Bothell	R.IC-21	New SR 405 Interchange at 240th Street SE(Bothell)				✓	✓
	Bothell	R.IC-24 & R-40	NE 160th Street-112th Ave to Juanita/Woodinville Wy See R-40			✓ *	✓ *	✓ *
	Bothell	R.IC-25	NE 195th Street-Ross Rd to North Creek Pkwy (additional capacity not needed)					
	Kirkland	R.IC-26 & R.PA-13	NE 132nd - 113th to 124th Ave NE				✓ *	✓ *
12.	Collector Distributors (CD) Matched to fit I-405 Improvements							
	Renton	R.CD-1	SR-167, SR-169, Sunset and SR 900/North Renton;					
	Bellevue	R.CD-2	Coal Creek, SR 90, SE 8th, NE 4th, NE 8th and SR 520;					
	Kirkland	R.CD-3	NE 70th and NE 85th;					
	Kirkland	R.CD-4	NE 116th and NE 132nd;					
	Bothell, King Co	R.CD-5	NE 160th, SR-522 and SR 527					
	HOV (HOV)							
7.	Committed HOV Projects							
	Bellevue	HOV-01	I-405 at NE 4th/6th/8th (Bellevue) / Construct new HOV direct access at NE 6th, Improve arterial capacity at NE 4th/8th interchanges	✓	✓	✓	✓	✓
	Bellevue	HOV-02	I-90 (Eastgate) / New I-90 HOV direct access connection to P&R	✓	✓	✓	✓	✓
	WSDOT	HOV-14	I-405 (I-5 Swamp Creek to SR 527)/Construct NB and SB HOV lanes total 6 lanes	✓	✓	✓	✓	✓
	KCDOT	HOV-15	E Lk Samm Pkwy (Iss-Fall City Rd to I-90 on ramp)/Widen to 4/5 lanes + HOV lanes. Outside of Study Area					
	ST	HOV-101	I-405 @ Lind/HOV direct access improvements.				✓	
	ST	HOV-102, R.HOV-58 & R.PA-1	Woodinville Arterial Enhancements/HOV arterial enhancements	✓	✓	✓	✓	✓
	Renton	R.HOV-32	Between Sunset and SR-900 /Park Ave interchange in Renton	✓	✓	✓	✓	✓
	Renton	R.HOV-33 & R.IC-12	NE 44th I/C - HOV Direct Access and Arterial Improvements(Assumes Port Quendall)	✓	✓	✓	✓	✓
	Kirkland	R.HOV-61	NE 85th				✓	
	Bothell	R.HOV-62	SR 522 Campus Access	✓	✓	✓	✓	✓
	Bothell	R.HOV-63	SR 527	✓	✓	✓	✓	✓
	Tukwila	R.HOV-64	Southcenter (In-Line Station). In line station at this location has been dropped.					
	ST	R.HOV-66	I-405 at NE 128th St/HOV Direct Access Improvements	✓	✓	✓	✓	✓

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Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
7.	HOV Interchange Ramps (Direct Access)							
	Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,			✓	✓	✓
	Renton	R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,			✓	✓	✓
	Bellevue	R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,			✓	✓	✓
	Bellevue	R.HOV-28	SR 520 Fwy to Fwy HOV ramps,			✓	✓	✓
	Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps			✓	✓	✓
	Sno. Co.	R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.			✓	✓	✓
	Newcastle	R.HOV-65	112th St SE (In-Line Station)			✓		
6.	Arterial HOV							
	Bellevue	R.HOV-36	Coal Creek Pkwy from I-405 to Forest Drive		✓	✓	✓	
	Bellevue	R.HOV-37	NE 8th Street from I-405 to 120th Ave NE		✓	✓	✓	
	Kirk, Redmond	R.HOV-38	NE 85th St from Kirkland Way to 148th Ave NE Vicinity		✓	✓	✓	
	Kirkland	R.HOV-39	NE 116th from 115th Ave NE to 124th Ave NE		✓	✓	✓	
	Kirkland	R.HOV-40	NE 124th from 113th Ave NE to 132 Ave NE		✓	✓	✓	
	Bothell	R.HOV-41 & R.IC-11	SR 527 From SE 228th St to SR 524		✓	✓ *	✓ *	
	Renton	R.HOV-43 & R.IC-4	SR 169 from SR 405 to Riverview Park Vicinity - HOV/Transit Preferential treatment.		✓	✓	✓	
	Renton	R.HOV-44	SW 27th St Corridor in Renton from Oaksdale Ave to SR 167		✓	✓	✓	
	Redmond	R.HOV-47	Avondale Rd from Novelty Hill Rd to Avondale Way/ Construct SB HOV lane		✓	✓	✓	
	Renton, King Co	R.HOV-48	SW 43 St from SR 167 to 140 Ave SE		✓	✓	✓	
	Renton	R.HOV-49	Logan Ave N/N 6 St from S 3 St to Park Dr, Transit Signal Priority		✓	✓	✓	
	Renton	R.HOV-51	Park Dr/Sunset Blvd from Garden Ave to Duvall Ave NE, Que Bypass'		✓	✓	✓	
	Kenmore	R.HOV-53 & R.PA-11	68 Ave NE (Simonds Rd to SR 522) - Construct NB HOV lane		✓	✓	✓	
	Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)		✓	✓	✓	
	Kirkland, Bellevue	R.HOV-56	Lake Washington Blvd (SR 520 to Yarrow Bay) - HOV lanes		✓	✓	✓	
	Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-405 Vicinity) Que Bypass'		✓	✓	✓	
	Bothell, Woodin	R.HOV-58, HOV-102 & R.PA-1	SR 522 (I-405 to SR 527 - Bothell) WB HOV Que Bypass - See HOV-102					
	Renton, King Co	R.HOV-59	Benson Rd - I-405 to SE Carr Rd - No Project					
	Bellevue	R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride Vicinity		✓	✓	✓	
23.	Freight (F)							
	Renton	R.FR-10 & R.BI-1	Modify SR 167 Interchange for East to South Freight movements		✓ *	✓ *	✓ *	
	Various	R.FR-11	Improve truck flow with ITS		✓	✓	✓	
	Various	R.FR-23	Remote area for overnight freight parking and staging for early morning deliveries		✓	✓	✓	
	Various	R.FR-26	Full depth shoulders for truck usage on key freeways and arterials)		✓	✓	✓	
	Various	R.FR-27	Traveler Information System (TIS) on SR 167 for I-405 "options"		✓	✓	✓	
	Various	R.FR-28	TIS on I-5 for SR 18/I-90; and 164th to I-405; and South 200th to I-405		✓	✓	✓	
	Various	R.FR-29	Centralized fax/radio for real time congestion reporting for dispatchers and truck drivers. Leverage WSDOT video linkages (e.g., a "T-911" number).		✓	✓	✓	
	Various	R.FR-30	Hours of operation and service periods optimized—"JIT" redefined for applicable service sectors (e.g. restaurants)		✓	✓	✓	
	Various	R.FR-32	Light cargo delivery using Sound Transit service		✓	✓	✓	
22.	Intelligent Transportation Systems (ITS)							
	Various	ITS-1	Add Camera Coverage to decrease TMC blind spots		✓	✓	✓	✓
	Various	ITS-2	Complete Ramp Metering		✓	✓	✓	✓
	Various	ITS-4	Dual Lane Ramp Metering		✓	✓	✓	✓

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	Various	ITS-5	Increased Incident Response		✓	✓	✓	✓
	Various	ITS-6	Traffic adaptive control on arterials		✓	✓	✓	✓
	Various	ITS-7	TIS before all major decision points		✓	✓	✓	✓
	Various	ITS-8	WSDOT support of in-vehicle traffic information		✓	✓	✓	✓
	Various	ITS-9	Arterial camera coverage		✓	✓	✓	✓
4.	High Capacity Transit (Physically Separated, Fixed Guideway HCT)							
	Tuk. & Renton	T.HCT-1	HCT- SeaTac to Renton CBD		✓	✓		
	Renton	T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)		✓	✓		
	Ren< New & Bel	T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria		✓	✓		
	Bell & Issa	T.HCT-4	HCT - Factoria To Issaquah		✓	✓		
	Bellevue	T.HCT-5	HCT Factoria to Downtown Bellevue		✓	✓		
	Bell & Red	T.HCT-6	HCT - Bellevue to Redmond		✓	✓		
	Bell & Kirk	T.HCT-7	HCT- Bellevue to Totem Lake		✓	✓		
	Kirk & King Co	T.HCT-8	HCT - Totem Lake to Bothell		✓	✓		
	Various	T.HCT-9	HCT - Bothell to Lynnwood		✓	✓		
4.	High Capacity Transit (Bus rapid transit [BRT] operating improved access HOV lanes on the existing freeway system)							
	Tuk. & Renton	T.HCT-1	HCT- SeaTac to Renton CBD				✓	
	Renton	T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)				✓	
	Ren< New & Bel	T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria				✓	
	Bell & Issa	T.HCT-4	HCT - Factoria To Issaquah				✓	
	Bellevue	T.HCT-5	HCT Factoria to Downtown Bellevue				✓	
	Bell & Red	T.HCT-6	HCT - Bellevue to Redmond				✓	
	Bell & Kirk	T.HCT-7	HCT- Bellevue to Totem Lake				✓	
	Kirk & King Co	T.HCT-8	HCT - Totem Lake to Bothell				✓	
	Various	T.HCT-9	HCT - Bothell to Lynnwood				✓	
4.	High Capacity Transit Stations							
	Sea-Tac	HCT.TS-1	Sea-Tac (Outside of Study Area)					
	Tukwila	HCT.TS-2	Southcenter		✓	✓	✓	
	Tukwila & Renton	HCT.TS-3	Tukwila (Longacres)		✓	✓		
	Renton	HCT.TS-4	Downtown Renton		✓	✓	✓	
	Renton	HCT.TS-5	North Renton		✓	✓		
	Renton	HCT.TS-6	Port Quendall		✓	✓	✓	
	Bellevue	HCT.TS-7	Factoria		✓	✓	✓	
	Bellevue	HCT.TS-8	Bellevue Transit Center		✓	✓	✓	
	Bellevue	HCT.TS-9	Bellevue Library		✓	✓		
	Bell & Kirk	HCT.TS-10	SR 520/Northup Way		✓	✓	✓	
	Kirkland	HCT.TS-11	Downtown Kirkland (NE 85th Street)		✓	✓	✓	
	Kirkland	HCT.TS-12	Totem Lake		✓	✓	✓	
	Woodinville	HCT.TS-13	NE 145th Street		✓	✓		
	Woodinville	HCT.TS-14	Woodinville		✓	✓		
	Bothell	HCT.TS-15	NE 195th		✓	✓	✓	

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	Bothell	HCT.TS-16	Canyon Park		✓	✓	✓	
	Sno County	HCT.TS-17	164th Street AW (AshWay)		✓	✓		
	Bellevue	HCT.TS-18	Eastgate		✓	✓	✓	
	King County	HCT.TS-19	Lakemont		✓	✓		
	Issaquah	HCT.TS-20	Issaquah 90Outside of Study area)					
	Bellevue	HCT.TS-21	132nd Avenue NE		✓	✓		
	Bellevue	HCT.TS-22	148th Avenue NE		✓	✓		
	Redmond	HCT.TS-23	Overlake (NE 40th Street)		✓	✓	✓	
	Redmond	HCT.TS-24	Redmond Town Center		✓	✓	✓	
	Redmond	HCT.TS-25	Bear Creek		✓	✓		
	Mercer Island	HCT.TS-26	Mercer Island		✓	✓	✓	
New Transit Service (TS)								
	Various	TS-0	Twenty percent more service than in the proposed 6-year plans for sound Transit, METRO and Community Transit	✓	✓	✓	✓	✓
	Various	TS-1	Fifty percent more service assumed in the current 6-year plans for Sound Transit, METRO and Community Transit					✓
3.	Transit Service (TS)							
	Various	TS-2	Twice the service in the proposed 6-year plans for Sound Transit, METRO and Community Transit		✓	✓	✓	
8.	Park and Rides (PR)							
	Renton	T.PR-3	Renton Highlands	✓	✓	✓	✓	✓
	Tukwila & Ren	T.PR-6	Tukwila Commuter Rail (Longacres)	✓	✓	✓	✓	✓
	K C	T.PR-8	SR 169 and 140th Place SE		✓	✓	✓	
	K C	T.PR-9	Petrovitsky Rd and 157th Ave SE		✓	✓	✓	
	K C	T.PR-10	140th Ave SE and SE 192nd		✓	✓	✓	
	K C	T.PR-11	SR 515 and SE 208th		✓	✓	✓	
	Kent & Renton	T.PR-12	SR 167 and SW 43rd		✓	✓	✓	
	Kent & Renton	T.PR-13	SR 167 and 84th Ave		✓	✓	✓	
	Redmond	T.PR-17	Willows Rd @ NE 100th		✓	✓	✓	
	Redmond	T.PR-18	SR 202 @ NE 100th		✓	✓	✓	
	Bell & Kirk	T.PR-20	South Kirkland	✓	✓	✓	✓	✓
	Redmond	T.PR-21	Overlake	✓	✓	✓	✓	✓
	Bellevue	T.PR-22	South Bellevue	✓	✓	✓	✓	✓
	Bellevue	T.PR-23	Newport (112th Ave. SE)	✓	✓	✓	✓	✓
	KC	T.PR-24	NE 160th/Brickyard Rd	✓	✓	✓	✓	✓
	Bothell	T.PR-25	Canyon Park (SR 405 and SR 527)	✓	✓	✓	✓	✓
	KC	T.PR-26	SR 202 @ NE 145th		✓	✓	✓	
	Tukwila	T.PR-30	Tukwila	✓	✓	✓	✓	✓
	Kirkland	T.PR-31	Houghton	✓	✓	✓	✓	✓
	Kirkland	T.PR-32	Kingsgate	✓	✓	✓	✓	✓
	Medina	T.PR-33	Evergreen Point	✓	✓	✓	✓	✓
	Bellevue	T.PR-34	Wilburton	✓	✓	✓	✓	✓
	King County	T.PR-35	Lakemont	✓	✓	✓	✓	✓
	Redmond	T.PR-36	Rendmond	✓	✓	✓	✓	✓
	Redmond	T.PR-37	Bear Creek	✓	✓	✓	✓	✓
	Bothell	T.PR-38	Bothell	✓	✓	✓	✓	✓

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	Kenmore	T.PR-39	Northshore	✓	✓	✓	✓	✓
	Kenmore	T.PR-40	Kenmore	✓	✓	✓	✓	✓
	Woodinville	T.PR-41	Woodinville	✓	✓	✓	✓	✓
	Mercer Island	T.PR-42	Mercer Island	✓	✓	✓	✓	✓
	Bellevue	T.PR-43	Eastgate	✓	✓	✓	✓	✓
9.	Transit Centers (TC)							
	Renton	T.TC-6	Downtown Renton	✓	✓	✓	✓	✓
	Bellevue	T.TC-8	Downtown Bellevue	✓	✓	✓	✓	✓
	Redmond	T.TC-9	Overlake	✓	✓	✓	✓	✓
	Kirkland	T.TC-12	Downtown Kirkland	✓	✓	✓	✓	✓
	Kirkland	T.TC-14	Totem Lake	✓	✓	✓	✓	✓
1.	TDM (TDM)							
	Various	TDM-1	TDM Package		✓	✓	✓	✓
		TDM-2	Expanded TDM Package- Regional Congestion Pricing		✓			
	Pedestrian and Bicycle Facilities (P&B)							
21.	I-405 Crossings							
	Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks		✓	✓	✓	✓
	Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility		✓	✓	✓	✓
	King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder		✓	✓	✓	✓
	Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder		✓	✓	✓	✓
	Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder		✓	✓	✓	✓
	Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved shoulder		✓	✓	✓	✓
	Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add ped/bike overcrossing of I-405		✓	✓	✓	✓
	Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility		✓	✓	✓	✓
21.	Pedestrian/Bicycle Connections							
	Bellevue,Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.		✓	✓	✓	
	Bellevue	NM.P&B-4	Lk Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities		✓	✓	✓	
	Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.		✓	✓	✓	
	Bel,Nwcas,Ren	NM.P&B-6	Lk Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility		✓	✓	✓	
	Renton	NM.P&B-14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities		✓	✓	✓	
	Renton	NM.P&B-15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike facilities		✓	✓	✓	
	Renton	NM.P&B-16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities		✓	✓	✓	
	Renton	NM.P&B-17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection		✓	✓	✓	
	Renton/Tukwila	NM.P&B-18	I-405/I-5 - via or around I-405/I-5 interchange - Add ped/bike facilities		✓	✓	✓	✓
	Tukwila	NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes		✓	✓	✓	✓
17.	Arterial Committed Projects		(Note: ID numbers are same as ETP ID's)					
	Bothell, Snohomish C	R.AC-21	120th NE/39th SE - NE 95th to Maltby Rd - 4/5 lanes including new connection	✓	✓	✓	✓	✓
	Bellevue	R-08	NE 29th PI (148th Ave NE to NE 24th St)/Construct new 2-lane road	✓	✓	✓	✓	✓

* Evaluated within another project

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

				Alternatives				
	Jurisdiction	ACTIONS		5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
	Snohomish Co.	R-10	SR 524 (24 St SW to SR 527)--- Widen to 4/5 lanes including sidewalks, bike lanes	✓	✓	✓	✓	✓
	Bothell	R-13	Beardslee Blvd (Main St to I-405)Widen to 3 lanes+CGS (Project does not add capacity)					
	Joint	R-17 & R-17(10)	I-90/SR 900 Interchange and SR 900 improvements--- Interchange reconfiguration. Project is outside of the Study Area					
	Issaquah	R-18	Issaquah bypass (Issaquah-Hobart Rd to I-90)-- Construct new 4/5 lanes with separated ped/bike trail. Project is outside of the Study Area.					
	Kirkland	R-21	NE 120 St (Slater Ave to 124 Ave NE)--- Construct new 3-lane roadway with ped/bike facilities	✓				
	Redmond/ WSDOT	R-25	SR 202 Corridor Improvements(East Lake Sammamish Pkwy to Sahalee Way)--- Widen to 3/5 lanes; intersection improvements with bike/ped facilities	✓	✓	✓	✓	✓
	Redmond	R-26	NE 90 St (Willows Rd to SR 202)--- Construct new 4/5 lanes + bike facilities	✓	✓	✓	✓	✓
	Redmond	R-28	West Lake Sammamish Parkway (Leary Way to Bel-Red Rd)--- Widen to 4/5 lanes + CGS, bike lanes	✓	✓	✓	✓	✓
	Renton	R-36	Oakesdale Ave SW (SW 31st to SW 16th)--- Construct new 5 lane roadway with CGS	✓	✓	✓	✓	✓
	WSDOT	R-38	SR 522 (SR 9 to SR 2)--- Widen to 4 lanes					
	KCDOT	R-39 & R.AC-2	140 Ave SE (SR 169 to SE 208 St)--- Widen to 5 lanes SR 169 to SE 196 St, widen for turn channels on SE 196. Combines 2 King County CIP projects. A major North-South arterial which serves the Soos Creek Plateau and Fairwood.	✓	✓	✓	✓	✓
	KCDOT	R-40 & R.IC-24	Juanita-Woodinville Way (NE 145 St to 112th Ave NE) Widen to 5 lanes + CGS, walkway/pathway	✓	✓	✓	✓	✓
	KCDOT	R-41	East Lake Sammamish Pkwy (Issaquah-Fall City Rd to SE 56 St)--- Widen 4/5 lanes including bike facilities. Construct CGS; interconnect traffic signals. Project is outside of the Study Area.					
	Issaquah	R-42	Sammamish Plateau Access Road (I-90 to Iss.-Pine Lake Rd)-- Prepare EIS, construct new 5-lane arterial w/ CGS, bike lanes. Project is outside of the Study Area.					
	Sammamish	R-44	228 Ave SE (SE 24th to NE 8 St)--- Widen to 4/5 lanes + CGS, bike lanes. Planned in 2 phases. Project is outside of the Study Area.					
	KCDOT	R-45	Issaquah-Fall City Rd (Issaquah-Pine Lake Rd to Klahanie Dr) - Phase II & III--- Widen to 4/5 lanes + CGS, bike lanes. Project is outside of the Study Area.					
	KCDOT	R-47	NE 124 St (Willows Rd to SR 202)--- Widen to 4/5 lanes + CGS, bike facilities; traffic signal.	✓	✓	✓	✓	✓
	KCDOT	R-48	Avondale Rd (Tolt Pipeline to Woodinville-Duvall Rd)--- Widen to 3 lanes + walkway/pathway (Project does not add capacity)					
	Woodinville	R-51	Woodinville-Snohomish Rd/140 Ave NE (NE 175 St to SR 522)--- Widen to 4/5 lanes + CGS, bike lanes	✓	✓	✓	✓	✓
	KCDOT	R-52	Woodinville-Duvall Rd (NE 171st St to Avondale Rd)--- Widen to 5 lanes + shoulders (without widening towards Woodinville the added capacity can't be used)					
	Bellevue	R-101	150th Ave SE---Widen to 7 lanes from SE 36th to SE 38th; add turn lanes	✓	✓	✓	✓	✓
	Redmond	R-111 & R.AC-15	Willows Rd Corridor Improvements-- Channelization of Willows Rd/Redmond Way intersection and widening of Willows Rd from NE 116th to NE 124th	✓	✓	✓	✓	✓
	Snohomish Co.	R-117	39th Ave SE Realignment at SR 524 and York Rd--- Construct 4-way intersection to replace 2 offset intersections	✓	✓	✓	✓	✓
17.	Planned Arterial Projects							
	Sound Transit	R.PA-1, HOV-102 & R.HOV-58	SR 522 (Woodinville to Bothell)--- HOV enhancements (ETP 246) See HOV-102					
	Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)			✓	✓	✓
	Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety improvements, consolidated driveways & left turn lanes; and sidewalks. (ETP R-107)			✓	✓	✓
	Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)			✓	✓	✓
	KCDOT	R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential treatment, turn channels. (ETP R-46)			✓	✓	✓
	KCDOT	R.PA-6	Petrovitsky Rd (143 Ave SE to 151 Ave SE) --- Widen to 5 lanes + CGS, bike lanes, traffic signal, interconnect (ETP 265). Project has already been constructed.					
	KCDOT	R.PA-7	Bear Creek Arterial (NE 80 St to Novelty Hill Rd)--- Corridor study and construction of new 3 lane arterial (ETP 141). Project is outside the study area					
	KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)			✓	✓	✓
	KCDOT	R.PA-9	SE 208 St (116 Ave SE to 132 Ave SE)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signal (ETP 263). Project has already been constructed.					

* Evaluated within another project

APPENDIX B
I-405 Corridor Program EIS Alternatives Project Matrix

				Alternatives				
	Jurisdiction	ACTIONS		5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
	KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)--- Construct new 3 lane arterial with CGS, bike lanes (ETP 61)			✓	✓	✓
	Kenmore/KCDOT	R.PA-11 & R.HOV-53	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22)			✓ *	✓ *	✓
	Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)--- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with ped/bike facilities (ETP R-23)			✓	✓	✓
	Kirkland	R.PA-13 & R.IC-26	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124)			✓	✓	✓
	Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP 309)			✓	✓	✓
	Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-24)			✓	✓	✓
	Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor – BROTS;			✓	✓	✓
	Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen Bear Creek Pkwy (ETP R-110)			✓	✓	✓
	Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)			✓	✓	✓
	Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)			✓	✓	✓
	Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS (ETP R-35)			✓	✓	✓
	Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation			✓	✓	✓
	Renton	R.PA-22	SW Grady Way (SR 167 to SR 515)--- Rechannelize and modify signals for a continuous eastbound lane (ETP R-37)			✓	✓	✓
	Renton	R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)			✓	✓	✓
	Renton/ KCDOT	R.PA-24	Soos Creek Regional Links--- Placeholder for Trans-Valley Study (ETP R-115)			✓	✓	✓
	Woodinville	R.PA-25 & R.AC-30	SR 522 Interchange Package(SR 522/SR 202 &SR522/195th St)--- Access improvements and new freeway ramps (ETP R-53) (See R.AC-30)			✓	✓	✓
	Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)			✓	✓	✓
	WSDOT	R.PA-27	SR 520/SR 202 Interchange --- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520 (ETP R-29)			✓	✓	✓
	WSDOT	R.PA-28 & R.AC-17	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)			✓	✓	✓
	WSDOT	R.PA-29	SR 202 (Sahalee Way to Bear Creek-Sammamish Arterial)-- Widen to 4/5 lanes (ETP 152). Project is outside the Study Area.					

* Evaluated within another project

APPENDIX C

Communications and Coordination

No specific correspondence was received. However, general coordination is presented in Section 3.2 of this report.

APPENDIX D
Riparian Enchroachment Impacts
by Project Element

Appendix D: Riparian Enchroachment Impacts by Project Element

	Alt 0		Alt 1		Alt 2		Alt 3		Alt 4	
PROJECT__	Crossings	Within 300'	Crossings	Within 300'	Crossings	Within 300'	Crossings	Within 300'	Crossings	Within 300'
Add one additional GP or Auxiliary lane in each direction					23	2			23	2
Add two additional GP or Auxiliary lanes in each direction							23	2		
Arterial Capacity Actions							3	2	3	6
Arterial Committed Projects	26	8								
Arterial HOV	4	3	32	6	28	6	30	8		
Arterial Interchange Improvements					4	4	2	2	6	2
Basic I-405 Improvements			21	10	21	10	3	2	21	10
Committed HOV Projects	4	2								
Connecting Freeway Capacity					17	3	20	2	25	3
Express Lanes - Access Locations									18	
Express Lanes - 2 Lanes each direction between Major Interchanges									23	2
High Capacity Transit			64	7	64	7				
Pedestrian I-405 Crossings			5	4	5	4	5	4	5	4
Pedestrian/Bicycle Connections			21	4	21	4	21	4		
Planned Arterial Projects					62	12	62	12	62	12
Widen SR 167 by 1 lane each direction to Study Area Boundary					2		2		2	
Totals	34	13	143	31	247	52	171	38	188	41

APPENDIX E

Background Information for Cumulative Effects

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1.0 CUMULATIVE EFFECTS

The Council on Environmental Quality's regulations implementing NEPA define cumulative effects as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR Section 1508.7). For the I-405 Corridor Program, the actions being evaluated are the proposed programmatic transportation improvements throughout the I-405 corridor in combination with past, present, and future land use development and other relevant non-project actions primarily within the four-county central Puget Sound region comprised of King, Kitsap, Pierce, and Snohomish counties.

1.1 Scope of Cumulative Effects Analysis

Scoping for the cumulative effects analyses was conducted to identify: (1) important cumulative effects issues; (2) critical resources that should be evaluated for potential cumulative effects; (3) geographic (spatial) boundaries for evaluating potential effects; (4) temporal (time frame) boundaries for each analysis; and (5) relevant past, present, and future actions that could affect the resources, ecosystems, and human communities of concern. This scoping ensured that the analyses were focused on those effects that were truly meaningful, and is consistent with guidelines that recommend cumulative effects analyses "count what counts."

Scoping for the cumulative effects analyses relied on information gained throughout the I-405 Corridor Program EIS process. The scope of the analyses was based on public and agency input requested during formal scoping meetings early in the EIS process; informal input received from the public and agencies as a result of public meetings; responses to I-405 Corridor Program newsletters and questionnaires; feedback from the Steering, Citizens, and Executive committees; and the results of prior research and technical analyses of direct and secondary effects conducted as part of the I-405 Corridor Program Draft EIS discipline studies.

1.1.1 Critical Resources

Geographic critical resources scoped for detailed evaluation of cumulative effects included: air quality; energy; surface water; wetlands; fish and aquatic habitat; and farmlands. These were scoped based on their heightened importance within the central Puget Sound region and/or I-405 corridor and their potential for substantial cumulative effects related to proposed I-405 Corridor Program improvements in combination with other foreseeable actions. Several reviewing agencies questioned whether energy and farmlands rose to the level that they should be scoped for analysis of potential cumulative effects. After further consideration it was agreed that analysis of these two elements would be included.

1.1.2 Geographic Boundaries

Geographic boundaries for evaluating potential cumulative effects were identified for each critical resource based on a number of factors. First, a geographic boundary for each resource analysis was identified by expanding the area of analysis to the point at which all potentially significant cumulative effects would be captured, and beyond which the resource would not be substantially affected. For analyses of natural environment elements such as fish and aquatic

habitat, the most meaningful natural boundary (in this case, the affected watershed[s]) was then identified and used as the geographic boundary for analyses. This does not mean that substantial cumulative effects were necessarily found to occur within these geographic units. Where natural boundaries were not meaningful, such as for energy, a different analytical boundary was selected that would be meaningful. The regulatory interests of agencies with jurisdiction also influenced some analytical boundaries, such as for air quality.

1.1.3 *Temporal Boundaries*

Similar to the geographic boundaries for evaluating potential cumulative effects, temporal boundaries also were identified for each resource analysis depending on the accumulation characteristics of the effects being assessed and the regulatory interests of agencies with jurisdiction. For most analyses of critical resources, year 2030 was selected as the future temporal boundary because it is the horizon year for *Destination 2030*, the 2001 update of the Metropolitan Transportation Plan, and encompasses *VISION 2020*, the region's long-range growth management, economic development, and transportation strategy. As discussed below, implementation of *VISION 2020* and the planned land use development that would result are by far the most consequential reasonable foreseeable actions that overlap geographically and temporally with the I-405 Corridor Program alternatives.

The cumulative effects of the No Action Alternative, which assumes implementation of *VISION 2020* and programmed and funded transportation improvements, were identified as the most meaningful baseline for comparing potential cumulative effects of the action alternatives on critical resources, ecosystems, and human communities of concern. Overall, the magnitude of effect attributable to the I-405 Corridor Program action alternatives relative to all other past, present, and future actions is expected to generally diminish as the future 2020 design year for the I-405 Corridor Program approaches.

1.1.4 *Framework for Cumulative Effects Analyses*

The 2001 update of the Metropolitan Transportation Plan (MTP), referred to as *Destination 2030*, includes many of the transit, freeway, and arterial improvements contained in the I-405 Corridor Program action alternatives. The environmental effects of these I-405 corridor improvements and all other proposed transportation investments in the region were reviewed at a programmatic level in the *Final EIS for Destination 2030, The Metropolitan Transportation Plan for the Central Puget Sound Region* (Puget Sound Regional Council, May 2001), which is incorporated here by reference. The potential cumulative effects of these improvements are re-evaluated here in slightly different combinations than in *Destination 2030* (as the I-405 Corridor Program action alternatives), and they are combined with some transportation improvements that were not included in *Destination 2030*. Nonetheless, the *Final EIS for Destination 2030* provides a useful point of reference for assessing the magnitude and significance of the I-405 Corridor Program alternatives.

The Puget Sound Regional Council (PSRC) 20-year projections of growth in households and employment within the central Puget Sound region provided a partial basis for evaluating the geographic distribution of potential cumulative effects on critical resources, ecosystems, and human communities. In order to accomplish this, the PSRC land use forecasting model (DRAM/EMPAL) was used because the study area is located within the four counties covered by

the PSRC. This is the same forecasting model used by the PSRC to develop and update the MTP. For the I-405 Corridor Program forecasts and analyses, the proposed transportation improvements contained within each alternative were entered into the DRAM/EMPAL model in the form of increased access and mobility. King County, Snohomish County, and the PSRC also were consulted in order to gain an understanding of issues related to model outputs.

1.2 Relationship to Metropolitan Transportation Plan and Other Regional Actions

1.2.1 Metropolitan Transportation Plan

Destination 2030 is the 2001 update of the 1995 Metropolitan Transportation Plan (MTP). *Destination 2030*, operating as the transportation element of VISION 2020, emphasizes an integrated multi-modal transportation system and describes the regionally significant modal components of that system. The MTP serves as a planning tool used to identify regional transportation problems and analyze and develop regional solutions, and it serves as a focus for required state and regional transportation system performance monitoring, particularly for the federally mandated congestion management system.

Destination 2030 supports a balanced multi-modal transportation system that provides options to users, but the plan recognizes that capacity enhancements are needed to improve mobility on the region's roadways. Under *Destination 2030* vehicle miles traveled (VMT) is expected to increase by 45 percent and population by 50 percent over the next 30 years. To address this growth, the plan calls for an aggressive program of transportation investments. With these investments, the growth in travel demand can be accommodated with relatively minor impacts on system performance, such as a 2 percent increase in congestion (PM peak) in 2030.

The Metropolitan Transportation System (MTS), which is the system component of *Destination 2030*, includes the following major elements:

Roadways. The roadway and high-occupancy vehicle (HOV) systems are integral components of the region's transportation system and will continue to be into the foreseeable future. Individual streets and roads do not function independently, but rather form a network through which traffic flows and connects to regional freeways. *Destination 2030* includes improvements on principal arterials and arterial HOV lanes, and adds general-purpose and HOV lane miles to the interstate and state route system in the four-county region.

Transit. The transit component is comprised of major regional transit services and facilities that provide public transportation access between major regional activities centers, connecting designated urban centers and major regional employment locations. Regional transit services can provide an alternate travel mode in congested corridors. In addition to the region's planned fixed-guideway HCT (light rail and commuter rail) and passenger-only ferry service, transit services are also represented by the transportation facilities they use – general-purpose lanes, HOV lanes, and exclusive transit rights-of-way. Regional transit facilities include major park-and-ride lots, transit centers, and ferry terminals.

Non-Motorized Transportation System. This component of the MTS includes pedestrian improvement zones located in designated urban centers and regional transit station areas including bus, rail, and ferry facilities.

1.2.2 I-405 Corridor Program Improvements Contained in Destination 2030

All of the core projects and strategies in the four action alternatives developed for the I-405 Corridor Program are included in *Destination 2030*. These transportation improvement projects and strategies are in response to the planned growth under the existing jurisdictional comprehensive plans, which in turn conform to the regional planned growth under *VISION 2020*. *Destination 2030* includes the I-405 study arterial, transit, and freeway improvements, and includes two general-purpose lanes in each direction on I-405. These additional lanes are included in Alternative 3.

The I-405 Corridor Program alternatives do not include all the HCT facilities that are included in *Destination 2030*. Links completing the HCT network around the region, such as north to Everett by 2030, are not included. Alternatives 1 and 2 do include the following fixed-guideway HCT routes and stations: Seattle to Issaquah across Mercer Island/I-90; SeaTac to Totem Lake in the I-405 corridor; and Bellevue to Redmond. In addition, the MTP uses HOV 2+, while the I-405 Corridor Program study uses HOV 3+ in the alternatives. Analysis showed that the HOV use along I-405 does not vary much among the study alternatives since the number of HOV lanes remains constant across alternatives. HOV 3+ use ranges from 3 to 4 percent of vehicles in the north end, and up to 10 percent in the south end of the corridor.

Appendix B identifies the projects within each alternative for the I-405 Corridor Program. The lists of projects included in the *Destination 2030* are found in Appendix 9 – Project List and the Supplemental Destination 2030 Project List of Destination 2030.

In addition, reasonably foreseeable federal, non-federal, and private actions identified during scoping that could be cumulative with the I-405 Corridor Program action alternatives are already addressed within the *Final EIS for Destination 2030* (May 2001). The most notable among these are the following, which are discussed in greater detail below:

- Trans-Lake Washington Project
- I-90 HOV transit improvements and lane additions between I-5 and I-405
- Sound Transit Phase II
- VISION 2020 proposed long-term regional land use plan

1.2.3 Trans-Lake Washington Project

WSDOT and Sound Transit have moved into the environmental analysis, documentation, and review phase of the Trans-Lake project to study options for crossing Lake Washington north of I-90, including the SR 520 bridge. In this phase, the recommendations from the study committee, as well as alternatives suggested by other community members, agencies, and advocacy groups, will be evaluated to determine the recommendations' value in improving mobility, their impacts on the environment and affected communities, and the steps that may need to be taken to avoid or mitigate negative impacts or to add positive impacts. An EIS will be prepared as part of the review process. The environmental analysis, documentation, and review process is expected to conclude in 2003. HCT across Lake Washington north of I-90 is not included in the I-405 Corridor Program or *Destination 2030*; the HCT is on the I-90 facility from the I-405 Interchange to downtown Seattle in Alternatives 1 and 2.

1.2.4 I-90 Transit Improvements and Lane Additions

HCT is assumed to operate along I-90 from Seattle to Issaquah by 2020 in Alternatives 1 and 2, and in *Destination 2030*. A Sound Transit study is currently looking at ways to improve transit on the I-90 bridge. It is not clear at this point if I-90 will convert the reversible express lanes to two-way transit operation, or whether they will remain as reversible lanes.

1.2.5 Sound Transit Phase II

Since 1996, Sound Transit has been implementing Sound Move, the first phase of the voter approved regional transit long-range vision that includes regional bus service, HOV access improvements, park-and-ride lots, and commuter rail and light rail. Except for commuter and light rail facilities, a variety of these regional HCT investments are being implemented along the I-405 corridor. At the present time all of the Sound Move commitments programmed for the I-405 corridor should be completed by 2006, the original completion year for Phase I. All Sound Move commitments are included in *Destination 2030* and the I-405 Corridor Program alternatives.

The Sound Transit Board is now considering substantial changes to routes and segment phasing for LINK light rail in Seattle, which would extend the first phase Sound Move implementation period for that element alone out to approximately 2009. Sound Transit has targeted 2004 as the probable year for a Phase II public vote on a new set of proposed regional HCT investments to be implemented between 2006 and 2016 or 2020. Assuming a positive vote outcome, the plan would provide additional (but as yet unspecified) HCT facilities and services to east King County, including jurisdictions within the I-405 corridor.

In the I-405 Corridor Program Alternatives 1 and 2, HCT was assumed to operate as a center-to-center fixed-guideway system utilizing BNSF and I-405 right-of-way along the length of I-405, with extensions to Redmond via SR 520 and to Issaquah via I-90 corridor alignments. Alternative 3 assumes that the high-capacity transit element would take the form of an advanced bus rapid transit system, primarily using HOV lanes, operating on I-405, SR 520, and I-90.

1.2.6 VISION 2020

Destination 2030 functions as the transportation element of *VISION 2020*. *VISION 2020* describes a regional land use pattern consistent with and supportive of the state's GMA policies (Growth Management Act). *Destination 2030* provides the regional transportation system to support the planned growth. The local comprehensive plans for cities in the study area were developed within the framework of *VISION 2020*. The alternatives for the I-405 study are consistent with all local jurisdictions' adopted land use zoning. The I-405 Corridor Program action alternatives are consistent with GMA in that they support implementation of the envisioned regional land use pattern.

1.3 Land Use, Development, and Transportation in the Region and Study Area

1.3.1 Regulatory Trends

Through the late 1980s and 1990s, new regulatory policies at the state, regional, and local levels were enacted that defined the boundaries within which growth would be accommodated and the amount of density that each city will need to accommodate over a 20-year horizon.

Washington State Growth Management Act

With little statewide or regional direction on growth, and the continued growth pattern, citizens' concerns triggered the adoption of the Washington State Growth Management Act (GMA) in 1990. The Act defined urban and rural growth areas (UGAs), designated urban centers (which came about through VISION 2020 and Countywide Planning Policies), established density targets in those urban centers, and established minimum levels of services on statewide infrastructure. For further detail see Section 3.13 and the *I-405 Corridor Program Draft Land Use Plans and Policies Expertise Report* (DEA, 2001a).

VISION 2020

The Puget Sound Regional Council (PSRC) adopted the update of *VISION 2020* in 1995. *VISION 2020* serves as a long-range growth management, economic, and transportation strategy. It establishes a multiple-center approach to development that promotes a jobs/housing balance and plans for needed transportation improvements, specifying that improvements should occur at the same time as employment growth to implement the infrastructure concurrency requirements of GMA. *VISION 2020* focuses growth into the Urban Growth Area (UGA) defined by each county. The Metropolitan Transportation Plan (MTP) was adopted in 1995 as the transportation element of *VISION 2020*.

Metropolitan Transportation Plan

As noted, the MTP was initially adopted in 1995. The MTP is a long-range plan to guide transportation investments in the central Puget Sound region. It includes specific provisions relevant to the I-405 corridor, including policies to support development of dense centers and a greater mix of land uses, connected by a network of transit and non-motorized modes of travel. Key components of the MTP include regional transportation pricing strategies, freeway and arterial HOV systems, facilities for pedestrians and bicycles, travel demand management, and establishment of high-capacity transit modes along congested corridors that connect urban centers. The Puget Sound Regional Council updated the 1995 MTP in a revised plan titled *Destination 2030* in May 2001. The basic building block of *Destination 2030* is *VISION 2020*, with the same emphasis on coordinated city, county, port, and transit agency plans, and adopted multi-county and countywide planning policies. *Destination 2030* takes into account the different growth patterns in the region and calls for focused growth in the urban centers. It also acknowledges implementation of a light rail system in the 2010 horizon with subsequent phases. *Destination 2030* takes an important step in calling for reduction of congestion points and includes many of the I-405 corridor improvements within the 2010 and 2030 horizons. The plan takes the existing list of projects from *VISION 2020* and revises them based on PSRC modeling.

It also includes a 2001–2010 “action strategy,” which calls for a regional phasing plan to determine which transportation projects should be built first for the best land use effect.

County-Wide Planning Policies

King County, Pierce County, and Snohomish County, working with the local cities, took the lead in developing and adopting County-Wide Planning Policies (CWPP), which integrated land use planning with transportation planning policies. Cities, including the Eastside cities within the I-405 study area, adopted the CWPP as one regional implementation tool of the GMA and VISION 2020 policies.

The CWPP establish the urban center concept, which is beginning to take form within the designated UGA. Some of the urban centers are in the I-405 corridor area and planned infrastructure improvements will affect their long-term viability.

All of the local jurisdictions in the I-405 Corridor Program study area have adopted comprehensive plans in accordance with requirements of GMA, the CWPP and the PSRC multi-county planning policies. These comprehensive plans include a transportation element that has been reviewed and certified by the PSRC as conforming to the transportation planning elements of the GMA, VISION 2020, and the MTP. There are 80 adopted comprehensive plans in the Puget Sound region, 74 of which have certified transportation elements. The concurrency requirements of transportation elements require that key infrastructures be built or planned for within a 6-year time frame of any proposed development. The I-405 Corridor Program alternatives are generally supportive of the applicable jurisdictional local transportation plans.

1.3.2 *Historical Land Use Changes and Trends*

The Puget Sound region has experienced tremendous growth in two large cycles, one in the 1960s and another in the 1980s and 1990s. The Puget Sound region is still growing in 2001, with annual growth rates projected at 1.1 to 2.0 percent out to 2030 (PSRC, 2001). Prior to the 1970s there was strong growth in the region with federal spending on aviation, expansion of military installations, import/export services, and related industrial goods. In the mid-1970s, the growth slowed and the Puget Sound region felt the “brakes” of the economy. In the mid-1980s, the region experienced a revival of the economy with the arrival of Microsoft and the “high-tech” industry, increased spending on military technology with Boeing, and an upturn in the national economy. While the growth rate was substantial in the 1960s, the current predominant Eastside land uses did not emerge until the 1980s when the area transitioned from rural/suburban, to suburban/urban with identifiable urban centers.

The Eastside (communities east of Lake Washington) began the Twentieth Century as a rural area. Development did not begin in earnest until after the completion of the first Lake Washington floating bridge across Mercer Island in 1940. The bridge dramatically decreased the time it took to travel between Seattle and the Eastside. During the next twenty years the previously rural Eastside was transformed into a major suburb of Seattle, with development focused in Bellevue and the other neighborhoods having easy access to U.S. 10 (now I-90). The second major phase in the contemporary development of the Eastside began when the second Lake Washington floating bridge was completed in 1963. The opening of SR 520 facilitated access and development in the 1970s and early 1980s of the northern and northeastern portions

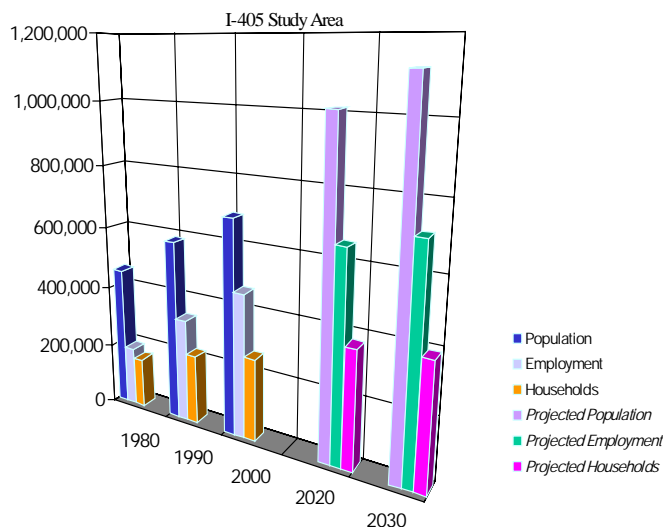
of the Eastside areas that had previously been difficult to access from Seattle. During the period the Eastside also became an important location for businesses and jobs, which increased 400 percent between 1960 and 1980.

The first businesses were retail, serving the needs of the residents, but from 1990 to 1997 the population increased by nearly 60,000 people and employment increased by 80,000 jobs as major international companies like Microsoft located on the Eastside and Boeing, the Eastside's biggest employer, expanded. Roadways were expanded and built in response to the employment and population growth. The land use plans and zoning currently approved for the Eastside anticipate considerable development over the next 30 years as well.

In the 1990s, towns that were once “bedroom” communities, such as Bellevue and Redmond, were transformed into major employment and commercial centers. The long-term regional growth trend has been toward population dispersion outward from Seattle and, late in the 1990s, from the Eastside cities eastward into agricultural and forested areas.

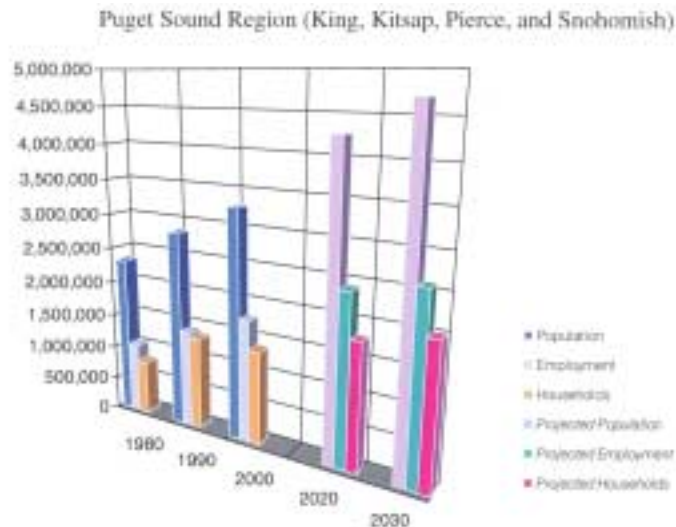
The I-405 corridor experienced the greatest growth between 1980 and 2000 as reflected in Figure 1.3-1. The growth that took place in employment and households was above the regional average.

Figure 1.3-1: Population, Employment, and Household Trends from 1980 to 2000 and Projections at 2020 and 2030



Between 2000 and 2030 the region is projected to add about 1.5 million people, 2 million new households, and 700,000 new jobs. The population in the region is expected to grow at an annual rate of 1.2 percent over the next 30 years, a substantial slowdown from the 2.0 percent pace of the 1960-00 period. By 2030, the population, as shown in Figure 1.3-2 is expected to reach 4.7 million, a 44 percent increase from the 2000 level.

Figure 1.3-2: Population, Employment, and Household Trends from 1980 to 2000 and Projections at 2020 and 2030



The trend of declining household size is expected to continue in the future, but at a more moderate pace. The updated forecasts project that, by 2030, there will be two million households in the region, a 50 percent increase above the 2000 total. The region's average household size is expected to be 2.3 people per household by the year 2030, down from the 2000 level of 2.5 persons per household (2001 MTP Baseline Technical Report – June 2000).

In the 1990s, aerospace was a major sector of the Puget Sound area's employment and economic base. In 1999, aerospace employment represented 40 percent of the total manufacturing sector jobs. Yet while aerospace was a substantial factor in the economy, the pre-packaged software industry accounted for 13 percent of the region's earnings in 1999. Recent forecasts indicate a shift in the regional economy to a new and growing sector – trade and service industries.

The forecast for 2030 economic performance will be tied to the growth in the trade and service industries. Projections suggest that trade and services will be the main growth sectors at an annual growth rate of about 1 percent or more between 2000 and 2030. The region is projected to have 1.5 million trade and service jobs, about 58 percent of all employment forecast through the year 2030 (2001 MTP Baseline Technical Report – June 2000).

1.3.3 Regional Land Use Trends and Growth

Summary of Population and Housing Trends in the Region

The Puget Sound region has experienced substantial growth in population during the past four decades. In the 1980s, the annual growth rate was approximately 2 percent with an estimated population of 2.7 million in 1990. The actual population ended up at more than 3 million in 1990, due to the in-migration drawn by a strong economy.

The substantial growth of in-migration of people took place between 1988 and 1989, when nearly 50,000 more people moved into this region than moved out. This exceeded the region's average of 20,000 for the previous 5 years. Population projections (Figure 1.3-2) indicate that by 2030, nearly 5 million people will be living within the region.

The housing trends are shown in Figure 1.3-2 from 1980 to 2030 for the region. Between 1995 and 1997 the number of residential units permitted increased regionally, with the number in King and Snohomish counties rising the fastest. Pierce and Kitsap counties experienced increases in permits from 1995 to 1996, but in 1997 fell 6 and 18 percent, respectively. Permits for single-family housing continued at a high level during the late 1990s and constituted the largest share of residential dwelling units.

The Growth Management Act (GMA), as discussed in regulatory trends, led to the establishment of the Urban Growth Area (UGA), a boundary for growth and designation of urban centers to absorb the growth. The UGA is likely to become denser as an additional million people populate the Puget Sound region by 2020. By the year 2030, a total of 1.7 million additional people are forecast to live in the region (Central Puget Sound Region - Growth Context Paper - PSRC Oct. 1999).

The UGA requires an effective transportation infrastructure, to provide access to the employment centers as well as the low-density suburban areas. The suburban areas are attractive due to lower land costs, but are often remote from employment opportunities. When housing is developed near employment centers, it may not be affordable to local employees, who then look further out – an ongoing development trend in east King County.

Summary of Employment in the Region

The Puget Sound region has experienced continued growth of both the manufacturing (aerospace and aviation) and service-oriented (software, computer technologies, and biotechnology) economic sectors. The I-405 corridor has a mix of both sectors, with aerospace manufacturing concentrated in the Kent and Renton areas and the software/high technology firms in Redmond, Bellevue, and the central and eastern areas. Both sectors generate high volumes of traffic on the freeway system.

Location analysis of selected industry clusters in the central Puget Sound region shows that certain industry groups tend to concentrate within particular parts of the region. Concentration of particular types of employment activity offer opportunities to examine transformations in the economic geography and travel behavior associated with different employment patterns, as discussed below (Central Puget Sound Region - Growth Context Paper - PSRC Oct. 1999).

In 1998, there were 190 aerospace firms in the region employing over 112,000 persons. The Boeing Company employs nearly 100,000 of these employees. Aerospace is concentrated, even after recent transfers among facilities, in south Seattle, Renton, Everett, and the Kent Valley. Non-Boeing aerospace employment (around 15,000 employees) tends to be located near the existing Boeing facilities.

Software firms employed nearly 30,000 persons in 1998. There were over 900 firms, 93 percent of which are small firms employing fewer than 50 employees. Half of all software employment is with Microsoft and 17 percent of the employment is with firms employing fewer than

50 employees. This has been an extremely high growth industry during the 1990s, with employment increasing by over 400 percent. These firms are primarily concentrated in downtown Seattle, Bellevue, Redmond, and to a lesser degree in other parts of east King County.

Biotechnology employment is concentrated primarily in downtown Seattle and around the University of Washington; some employment is located in the “high tech corridor” along I-405 in north King County and in Snohomish County. In 1998, biotechnology had an employment of 8,500 in 323 firms.

Temporary agency employment has seen high growth since 1990. Employment increased from 16,800 to 37,500. The size of temporary employment firms has increased much faster than the number of firms. These firms are highly concentrated and are primarily located in downtown Seattle and Bellevue.

These employment patterns and locations provide an insight into the many different pressures on the I-405 corridor to provide the means of movement of goods and people.

1.3.4 I-405 Study Area Land Use Trends and Growth

Summary of Population and Housing Trends in the I-405 Study Area

The I-405 area experienced substantial growth in the 1980s as shown in Figure 1.3-1. The projections for the I-405 study area in population growth, assuming an annual growth rate in the range of 1.4 to 2.0 percent, increase from 687,300 in 2000 to 1,010,500 in 2020 and 1,116,300 by 2030.

The household growth in the study area is expected to continue with a greater proportion living in multi-family units in the urban centers. Assuming an annual growth rate in the range of 0.5 percent to 1.2 percent, the households would increase from 265,200 in 2000 to 369,300 in 2020 and 390,500 by 2030. On a broader eastside view, PSRC forecasts indicate a growth rate in 2000 at 1.7 percent and dropping to 0.7 percent in 2030 for single-family households. The growth rate for multi-family units is forecast to range from 3.6 percent in 2000 to 0.7 percent in 2020, rising back up to 1.7 percent by 2030.

As discussed previously, the I-405 corridor has transitioned from a rural/suburban community into an urban area, focusing the continued growth into the urban centers of Bellevue, Redmond, Tukwila, Kirkland, and Renton. At the same time, the transportation infrastructure of I-405, SR 520, I-90, and the associated east/west major arterials are at capacity during peak hours.

The land use pattern in the I-405 corridor has followed the regional patterns, with focused employment centers and low-density suburban expansion outside of the downtown cores of Bellevue, Redmond, and Kirkland. Large residential subdivisions served by major arterials have experienced growth, with a parallel growth in the downtown cores of the eastside cities.

Summary of Employment in the I-405 Study Area

The I-405 study area, in comparison to the Puget Sound region (Figure 1.3-2), has grown at a greater pace in employment in the 1990s (Figure 1.3-1), and estimates project continued growth in the employment base. Projections, assuming an annual growth rate in the range of 0.8 to 1.5 percent, show employment rising from 462,300 in 2000 to 653,000 in 2020 and 708,400 by 2030.

The land use pattern on the Eastside is dependent upon the automobile. The potential for reducing single occupant vehicle trips and congestion is addressed in *Destination 2030* and the I-405 Corridor Program by continuing to develop HOV modes. Strategies include HOV priority lanes, high-capacity transit improvements (increased bus service and light rail), expanded commute trip reduction programs, and transportation demand management programs.

1.3.5 *Results of DRAM/EMPAL Modeling for Region and Study Area*

The PSRC land use forecasting model (DRAM/EMPAL) covers the four-county central Puget Sound region of Snohomish, King, Pierce, and Kitsap counties. This forecasting model is used by the PSRC to develop and update the MTP, including *Destination 2030*. State law requires the transportation elements of local comprehensive plans to be certified as consistent with the MTP. See the *I-405 Corridor Program Draft Land Use Expertise Report* (DEA, 2001b) for a more detailed discussion of the assumptions in the modeling process.

Based on the above trends, it was important in analyzing cumulative effects to view the population, employment, and households within the context of the regional plans, and therefore the PSRC model was utilized on small geographic areas known as forecast analysis zones (FAZ). The model projected employment and household growth within the FAZ geographical areas over the next 20 years. The projected growth of employment and households is based on the share of the state's population growth allocated to each county within the study area by the State Office of Financial Management (OFM) as required by the Growth Management Act (GMA). Each county and its cities are mandated by GMA to work collaboratively to plan for the coordinated accommodation of this projected growth in their respective comprehensive plans and ensuing implementation actions. Evaluating the I-405 Corridor Program alternatives necessitated adding the proposed transportation improvements (for example, miles of additional I-405 freeway general-purpose lanes) to the DRAM/EMPAL model in the form of increased access and mobility. In addition, King County, Snohomish County, and the PSRC were consulted in order to gain an understanding of issues related to projected growth and planned land use changes.

The results of the modeling were used to identify the cumulative effects, if any, on pressure for growth and development within the forecast analysis zones. Changes in mobility and accessibility within the study area could influence the locational preferences of individuals, businesses, and households. The sum of these individual preferences regarding where people live and work translate into changes in pressure for growth and assumed development activities, as regulated by local land use plans and zoning. These potential development activities are the cumulative effects from the I-405 Corridor Program combined with other regional corridor programs. When the action alternatives are compared to the No Action Alternative, there is a nominal range of decreases and increases in pressure for growth and development. This is assumed to be influenced by variations in the way each alternative enhances access to different portions of the I-405 corridor.

Destination 2030 includes many of the I-405 Corridor Program, SR 520, I-90, and SR 522 improvements. The cumulative effects of these transportation improvements on land use could be positive, with growth in population, employment, and households locating in the urban centers and in-fill development along the I-405 corridor.

The No Action Alternative does show a 24 percent increase in the projected growth from 2000 to 2020, but that is still within the range of projected growth for the region and the area, as defined by PSRC modeling. The No Action Alternative is an existing element within the PSRC model, as it includes existing and committed transportation projects.

The I-405 Corridor Program alternatives are compatible with existing regional and local land use plans, which already address growth.

It is important to remember that the No Action Alternative includes the committed projects that are likely to be built in the near future, and therefore are used for comparison purposes. The DRAM/EMPAL model forecasts the change of the No Action Alternative from 2000 to 2020, and the action alternatives are compared to the No Action Alternative at 2020.

No Action Alternative

The No Action Alternative could influence potential limited, localized effects in the form of increased pressure for growth in households outside of the Urban Growth Area. Figure 1.3-3 shows the future land use in the study area and Figures 1.3-4 and 1.3-5, based on the PSRC model, show the projected growth of employment and households that are forecast to take place by 2020 under the No Action Alternative. The No Action Alternative includes growth throughout the four-county region.

Table 1.3-1 lists areas of increase in employment and households in the central Puget Sound region. The employment growth within the study area is expected to occur along the I-405 corridor and throughout Seattle, the Sammamish Plateau, Kent Valley, Pierce County, North Bend, and Snoqualmie. Some household growth would occur outside of the UGA in south Snohomish County, east King County, northwest Pierce County, and Kitsap County.

Table 1.3-1: No Action Alternative Areas of Increase in Employment and Households

Regional Jurisdictions	Local Jurisdiction with Employment Growth over 3000 Employees in 2020	Local Jurisdiction with Household Growth over 3000 units in 2020
Snohomish County	Everett and Lynnwood	Lynnwood, Mill Creek, Mukilteo
King County	Kirkland, Redmond, Bellevue, Issaquah, Newcastle, Renton, Tukwila, SeaTac, Kent, Auburn, and Federal Way	Woodinville, Redmond, Bothell, Carnation, Bellevue, Issaquah, Tukwila, SeaTac, Kent, Auburn, Covington, Federal Way
Pierce County	Algona, Pacific, Tacoma, Lakewood	Puyallup, Algona, Pacific, Bonney Lake, Sumner, Lakewood

Despite pressure for additional growth outside of the UGA, substantial growth (Figures 1.3-4 and 1.3-5) still would occur within designated urban centers. The designated urban centers that are expected to receive the highest level of employment growth are Everett, Lynnwood, Redmond, Bellevue, Tukwila/South Center, Kent, SeaTac, Auburn, and Federal Way.

The designated urban centers that would receive the highest level of household growth are Lynnwood, Redmond, Bellevue, Tukwila/South Center, SeaTac, Kent, Federal Way, and Puyallup.

Table 1.3-2 shows current and projected employment and households in 2020 for the counties and study area. It is important to note that the 2020 regional growth projections for the No Action Alternative are nearly the same (within 2 percent) as those for the action alternatives, indicating that there is very little change in overall pressure for growth and development among the alternatives.

Another cumulative effect of the No Action Alternative is the effect on land use and transportation concurrency. The local jurisdictions in the I-405 study area are facing serious traffic concurrency problems. If those issues are not managed effectively and addressed adequately by 2020, it is possible that the planned growth might not be able to be accommodated by local jurisdictions. The existing concurrency problems in most of the local jurisdictions would be exacerbated in the future under the No Action Alternative.

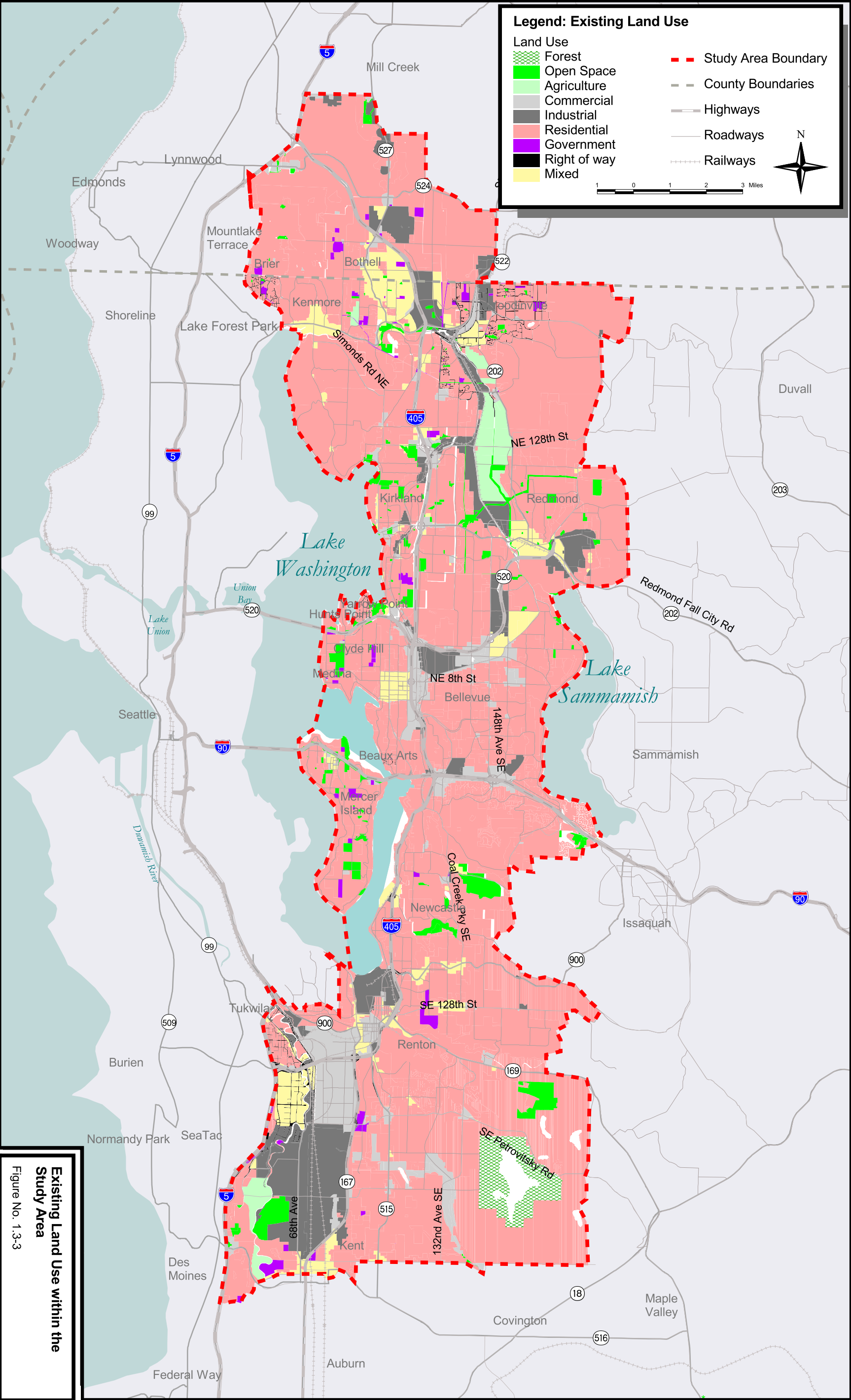
Table 1.3-2: No Action Alternative Changes in Employment and Households

Location	Employment				Households			
	2000	2020	Change	Percent Change	2000	2020	Change	Percent Change
	(a)	(b)	(b)-(a)	2000-2020	(a)	(b)	(b)-(a)	2000-2020
King County	1,180,564	1,474,469	293,905	24.9	741,167	967,180	226,013	30.5
Kitsap County	90,962	120,954	29,992	33.0	96,257	137,421	41,164	42.8
Pierce County	294,393	365,085	70,692	24.0	272,835	348,078	75,243	27.6
Snohomish Co.	233,289	300,568	67,279	28.8	227,522	334,335	106,813	46.9
Regional Total	1,799,208	2,261,076	461,868	25.7	1,337,781	1,787,014	449,233	33.6
Study Area	447,936	576,335	128,399	28.7	270,037	360,603	90,566	33.5

The average traffic level of service was calculated for jurisdictions within the I-405 study area. The results show virtually every jurisdiction within the study area would reach or exceed currently adopted concurrency levels by 2020, including:

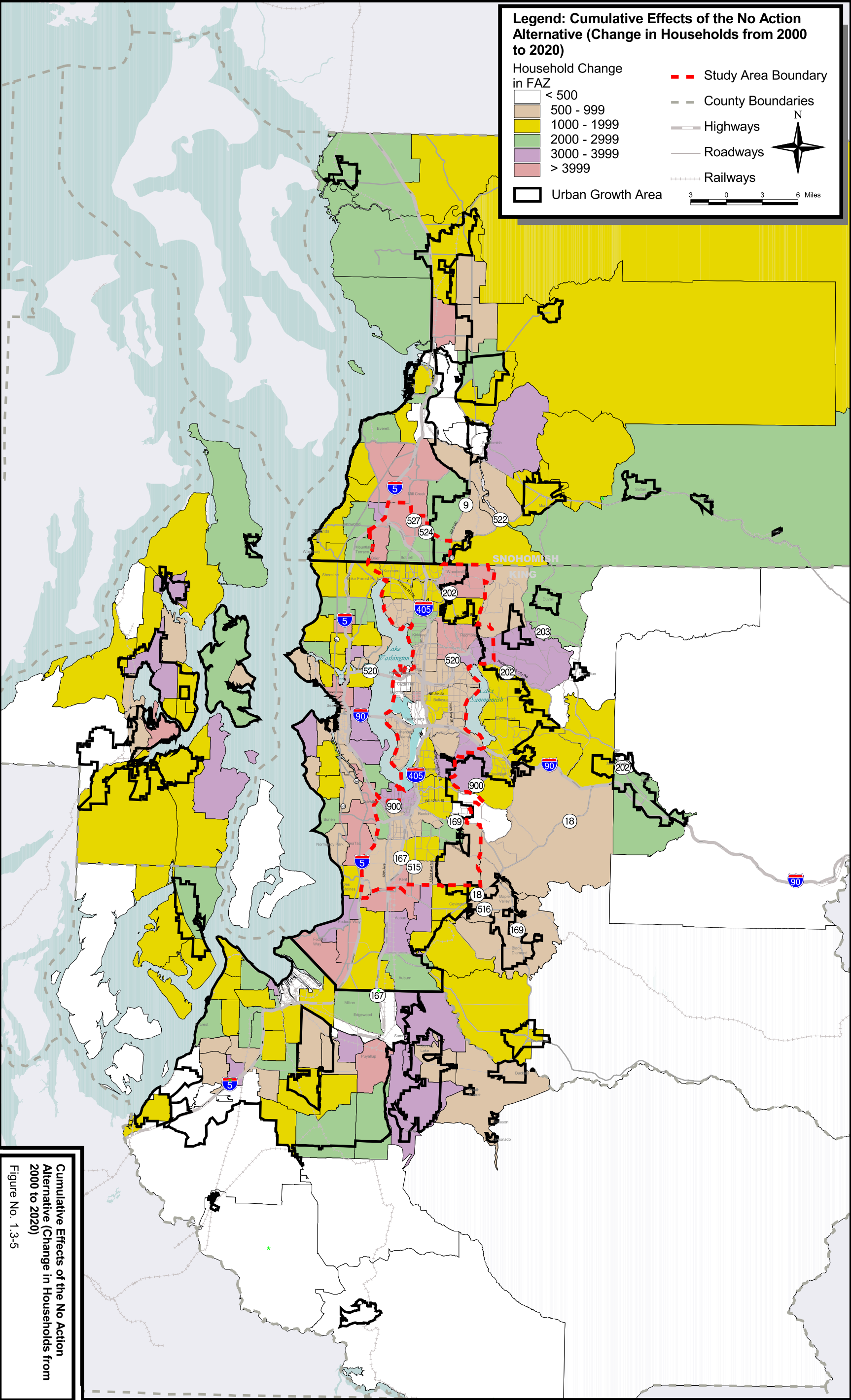
- Tukwila (Southcenter area)
- Renton (most areas)
- Newcastle (western portion)
- Bellevue (downtown, Factoria, Bel-Red)
- Mercer Island
- Kirkland (most areas)
- Redmond (western portions, including Overlake)
- Bothell (Snohomish County portion)
- Mill Creek (most areas)
- Lynnwood (most areas)

If concurrency cannot be achieved, growth would be expected to disperse elsewhere within or outside of the study area where it can be permitted.



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Legend: Cumulative Effects of the No Action Alternative (Change in Households from 2000 to 2020)

Household Change in FAZ

- < 500
- 500 - 999
- 1000 - 1999
- 2000 - 2999
- 3000 - 3999
- > 3999

Urban Growth Area

- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways



3 0 3 6 Miles

Cumulative Effects of the No Action Alternative (Change in Households from 2000 to 2020)

Figure No. 1.3-5

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This could exacerbate pressure for growth in rural areas outside the UGA or premature growth at the urban fringe of the UGA. If allowed to occur by local land use agencies, this pattern of growth would have potential cumulative effects such as increased demand on the transportation infrastructure, demand on public services, adverse impacts on the environment, vehicular congestion, and long-term increases in the cost of providing public services.

Alternative 1: HCT/TDM Emphasis

Compared to the No Action Alternative, under Alternative 1 the I-405 corridor could experience a slightly greater concentration of employment within the study area and a greater number of households within the designated urban centers and around the HCT stations within the corridor. See Table 1.3-3.

Table 1.3-3: Alternative 1 Changes in Employment and Housing from the No Action Alternative

Location	2020 Employment				2020 Households			
	No Action Alternative	Alternative 1	Change	Percent Change From No Action Alternative	No Action Alternative	Alternative 1	Change	Percent Change From No Action Alternative
	(a)	(b)	(b) – (a)		(a)	(b)	(b) – (a)	
King County	1,474,469	1,471,969	-2,500	-0.2	967,180	965,682	-1,498	-0.2
Kitsap County	120,954	120,921	-33	0.0	137,421	137,543	-122	0.1
Pierce County	365,085	364,995	-90	0.0	348,078	348,063	-15	0.0
Snohomish Co.	300,568	303,204	2,636	0.9	334,335	335,855	1,520	0.5
Regional Total	2,261,076	2,261,089	13	0.0	1,787,014	1,787,143	129	0.0
Study Area	576,335	575,882	-453	-0.1	360,603	360,573	-30	0.0

Figure 1.3-6 shows projected employment under Alternative 1. Employment growth could result along the I-405 and SR 167 corridors where new fixed-guideway HCT and TDM strategies would be implemented.

Figure 1.3-7 shows projected households under Alternative 1. On a sub-regional level, Alternative 1 could influence pressure on the Eastgate, Factoria, Kent, Kirkland, Lynnwood, and Redmond areas to allow additional employment and housing. The household growth could take place around the urban centers with an improved range of multi-modal transportation choices to regional employment centers, coupled with the future station area planning and implementation of Sound Transit's Sound Move program. This trend would likely emerge as regional and local plans and implementation programs support transit-supportive land uses.

However, since Alternative 1 would not reduce the levels of traffic congestion in much of the study area, compared to the No Action Alternative, it would not be effective in addressing the concurrency problems at the local level. The increased pressure for employment and population growth described above would need to be matched with local actions to maintain adequate transportation levels of service. Without effective transportation improvements, projected growth might not be realized as planned and development could disperse to less suitable areas outside the urban centers and UGA.

Alternative 2: Transit Emphasis

Compared to the No Action Alternative, pressure for growth in employment would be expected to increase in the I-405 corridor and decrease for Seattle, Pierce County, and, to a lesser degree, Kitsap County. Figure 1.3-8 shows the projected employment pattern in the region under Alternative 2. The future employment is forecast to increase in the northeastern and southern portions of the I-405 corridor, specifically in Redmond, the Duvall UGA, and the Kent Valley. See Table 1.3-4.

Table 1.3-4: Alternative 2 Changes in Employment and Housing from the No Action Alternative

Location	2020 Employment				2020 Households			
	No Action Alternative	Alternative 2	Change	Percent Change From No Action Alternative	No Action Alternative	Alternative 2	Change	Percent Change From No Action Alternative
	(a)	(b)	(b) – (a)		(a)	(b)	(b) – (a)	
King County	1,474,469	1,473,785	-684	0.0	967,180	966,821	-359	0.0
Kitsap County	120,954	120,068	-886	-0.7	137,421	135,956	-1,465	-1.1
Pierce County	365,085	363,894	-1,191	-0.3	348,078	347,789	-289	-0.1
Snohomish Co.	300,568	303,343	2,775	0.9	334,335	336,574	2,239	0.7
Regional Total	2,261,076	2,261,090	14	0.0	1,787,014	1,787,140	126	0.0
Study Area	576,335	579,866	3,531	0.6	360,603	364,554	3,951	1.1

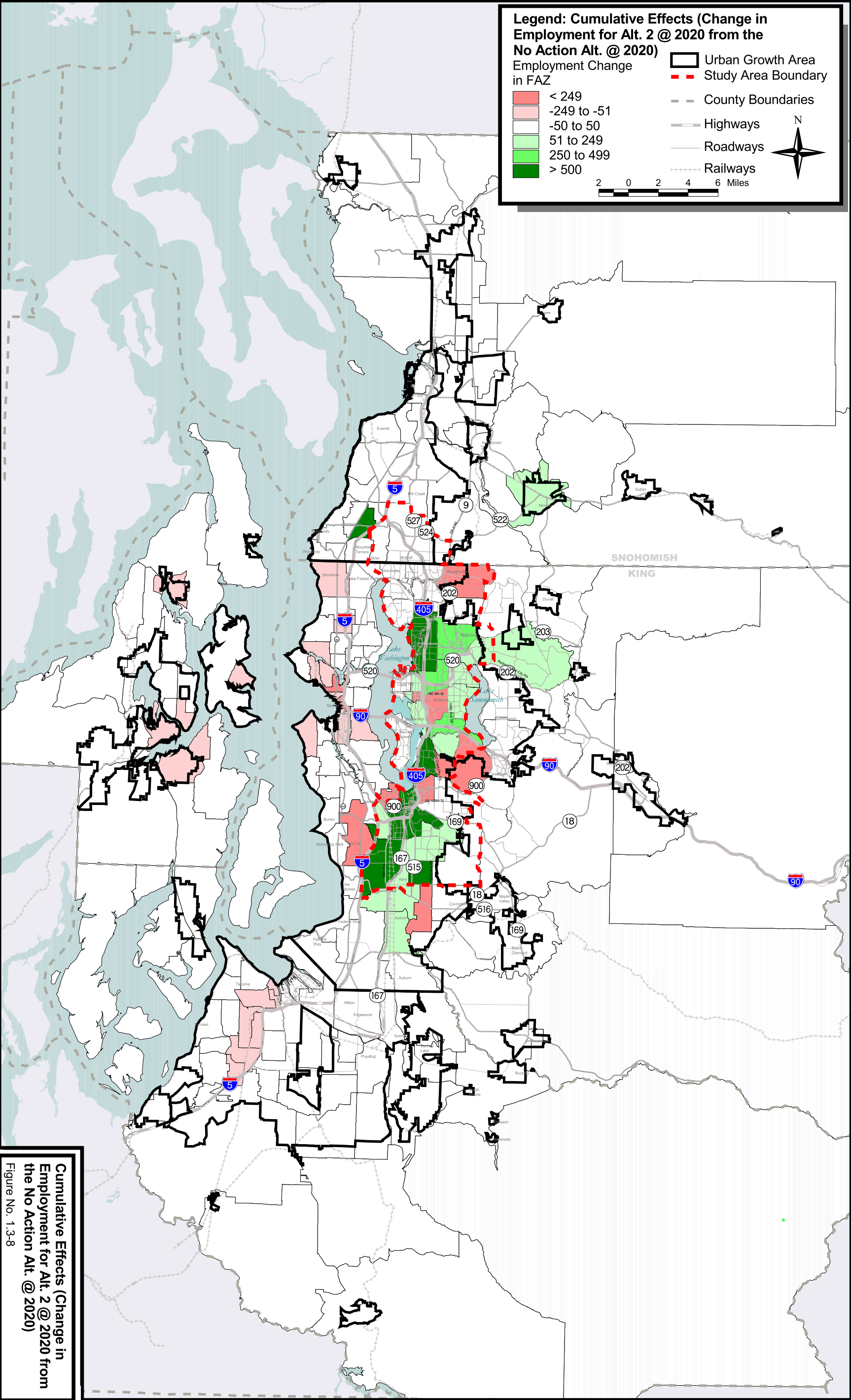
The overall pattern of change in households under Alternative 2 would be similar to that in Alternative 1, although additional pressure for household growth may occur in the Mill Creek, Lynnwood, and Bothell areas in the north, and in Federal Way and Kent to the south. Figure 1.3-9 shows the projected pattern of households under Alternative 2. It is projected that the number of households would increase in south Snohomish County, Redmond, Kirkland, Kent, Auburn, and Federal Way. It is expected that the urban centers (Canyon Park, Lynnwood, SeaTac, Kent, and Federal Way) would absorb much of the growth.

In Alternative 2, the urban centers and future HCT stations would likely become stronger focal points for growth in employment and households in support of the land use strategies of the region, and in relation to transit-oriented development (TOD). TOD would be likely in the urban centers and in the corridor between the centers regardless of the timing of light rail, as it is regional policy and an economic tool for local jurisdictions.

The overall effects under Alternative 2 would be similar to Alternative 1, except that Alternative 2 would add capacity to I-405 and provide some reduction in study area traffic congestion. This would better allow local jurisdictions to meet concurrency requirements in a manner that would facilitate the clustering of growth and development within urban centers and the UGA. Alternative 2 would conform to local plans to help reduce the spillover or continued pattern of growth outside of the UGA; however, the increased pressure for employment and population growth would still need to be matched with local actions to maintain adequate transportation levels of service. Without effective transportation improvements, projected growth might not be realized as planned and development could disperse to less suitable areas outside the urban centers and UGA.

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Legend: Cumulative Effects (Change in Employment for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- 249 to -51
- 50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

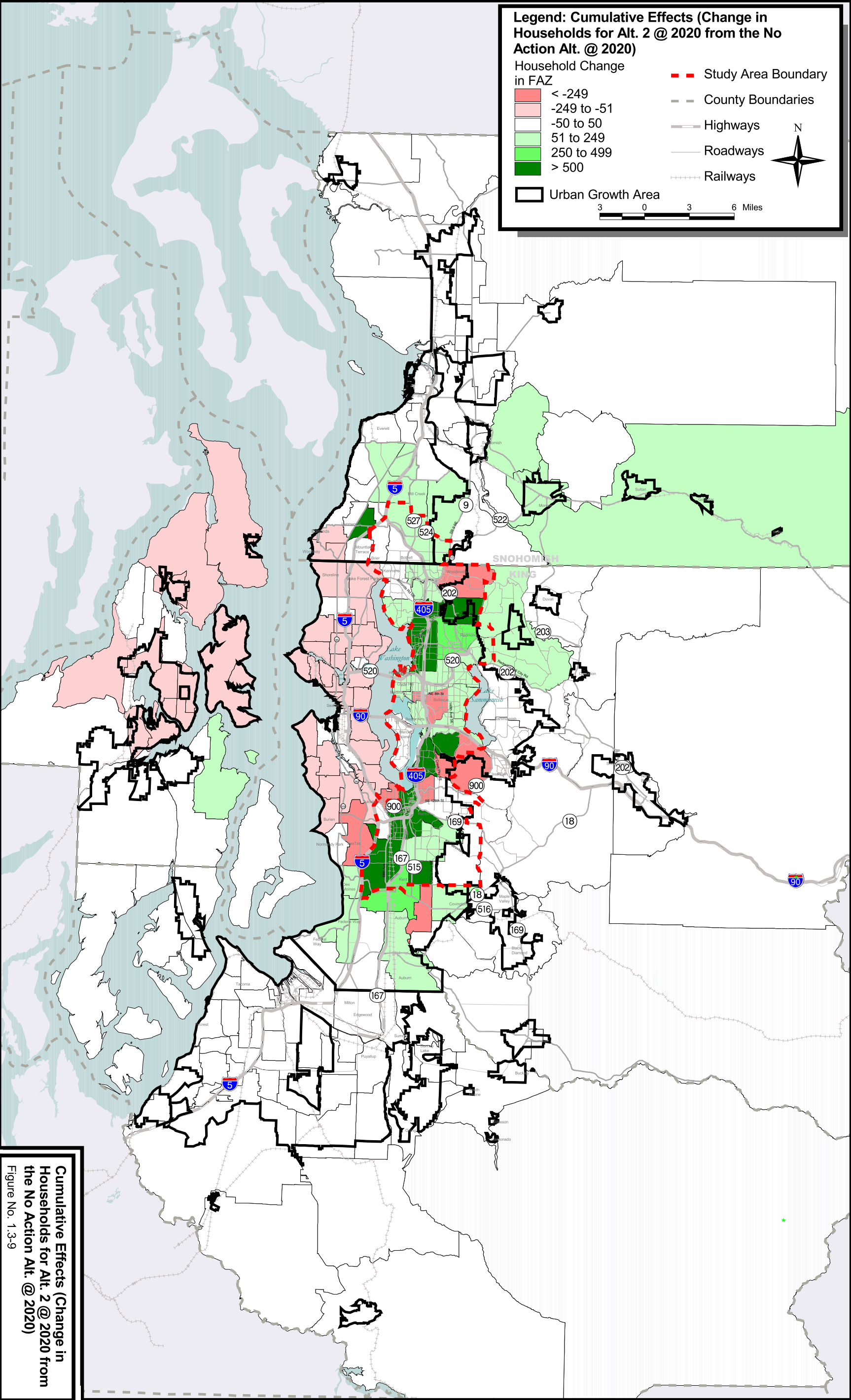
2 0 2 4 6 Miles

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Cumulative Effects (Change in Employment for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

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Cumulative Effects (Change in Households for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-9

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Alternative 3: Mixed Mode Emphasis

Compared to the No Action Alternative, pressure for employment and housing growth would be expected to increase in the study area and UGA in Alternative 3. This would support planned development in designated urban centers and around the HCT stations. Alternative 3, as shown in Table 1.3-5, would have effects similar to Alternative 2, but with increased pressure for employment and households within the corridor. From a regional perspective, the added capacity on I-405, the BRT system, increased reliance on HOV projects, arterial improvements, and implementation of TDM strategies would create improved accessibility to those portions of the I-405 corridor already planned for higher urban densities.

Table 1.3-5: Alternative 3 Changes in Employment and Housing from the No Action Alternative

Location	2020 Employment				2020 Households			
	No Action Alternative	Alternative 3	Change	Percentage Change From No Action Alternative	No Action Alternative	Alternative 3	Change	Percent Change From No Action Alternative
	(a)	(b)	(b) – (a)		(a)	(b)	(b) – (a)	
King County	1,474,469	1,474,905	436	0.0	967,180	967,883	703	0.1
Kitsap County	120,954	119,289	1,665	-1.4	137,421	134,539	2,882	-2.1
Pierce County	365,085	363,257	1,828	-0.5	348,078	346,729	1,349	-0.4
Snohomish Co.	300,568	303,650	3,082	1.0	334,335	338,008	3,673	1.1
Regional Total	2,261,076	2,261,101	25	0.0	1,787,014	1,787,159	145	0.0
Study Area	576,335	582,455	6,120	1.1	360,603	367,600	6,997	1.9

Figures 1.3-10 and 1.3-11 show the differences in the projected pattern of employment and households under Alternative 3. The projected pressure for growth would be similar to Alternative 2, but with greater forecast employment and households in the northern and southern portions of the I-405 corridor.

Alternative 3 is similar to Alternative 2 in that the urban centers and the transit stations would become stronger focal points for growth in employment and households. There are two areas within the study area (Kirkland/Redmond and Newcastle/Renton/Kent) that would be expected to experience greater pressure for growth in employment and households as seen under Alternative 3 (Figures 1.3-10 and 1.3-11). Alternative 3 could enhance planned growth within key portions of the UGA planned for higher density development. This alternative supports regional policies seeking to create connectivity, density, and transit-oriented development to reduce growth impacts outside the UGA. The growth pattern associated with Alternative 3, when compared to the No Action Alternative, suggests that it may result in lessening of growth pressures on lands outside the UGA.

Alternative 3 provides for the greatest implementation of projects that are supportive of *Destination 2030* policies and locally adopted comprehensive plans. All of these regional and local policies call for the improvement of the regional transportation infrastructure and reduction in traffic congestion. The capacity expansions on I-405 included in Alternative 3 would shift some traffic onto I-405 from the arterials and provide reduction in study area traffic congestion. Thus, this alternative would provide the best opportunity for local agencies to meet

concurrency standards, implement clustering of development, and increase density within the urban centers and the UGA with a transportation system that serves as required under the Growth Management Act.

Alternative 4: Roadway Capacity Emphasis

Under Alternative 4, as shown in Table 1.3-6, pressure for employment and housing would be expected to increase in the I-405 corridor as compared to the No Action Alternative. Figure 1.3-12 shows the projected employment pattern in the region under Alternative 4. Additional pressure for employment in the Woodinville, Kirkland, and Renton/Kent Valley area would be expected partially due to increased accessibility. Alternative 4 is forecast to result in less employment outside of the UGA compared to the No Action Alternative condition.

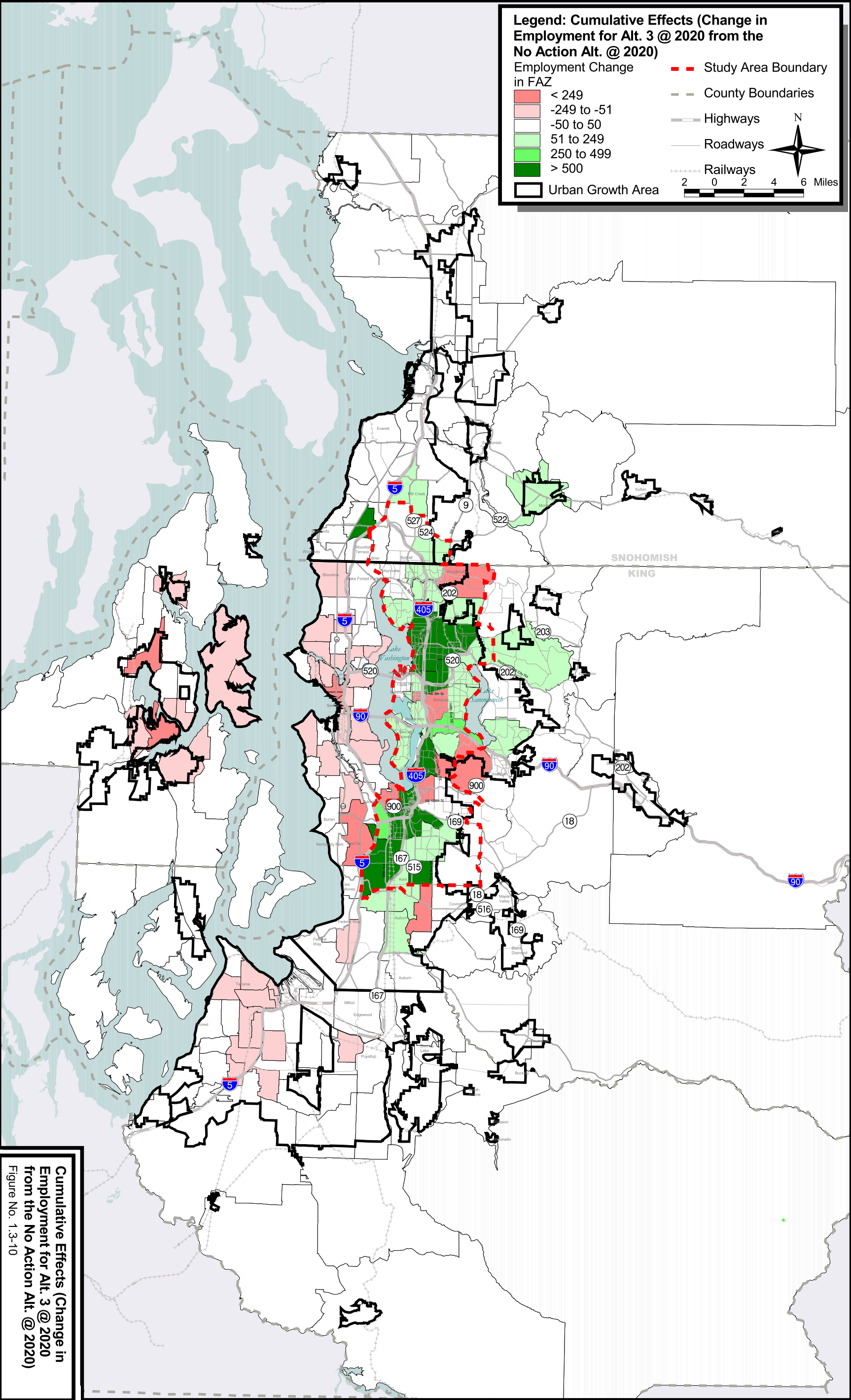
Table 1.3-6: Alternative 4 Changes in Employment and Housing from the No Action Alternative

Location	2020 Employment				2020 Households			
	No Action Alternative	Alternative 4	Change	Percent Change From No Action Alternative	No Action Alternative	Alternative 4	Change	Percent Change From No Action Alternative
	(a)	(b)	(b) – (a)		(a)	(b)	(b) – (a)	
King County	1,474,469	1,474,966	497	0.0	967,180	966,953	227	0.0
Kitsap County	120,954	119,076	1,878	-1.6	137,421	134,410	3,011	-2.2
Pierce County	365,085	362,941	2,144	-0.6	348,078	346,376	1,702	-0.5
Snohomish Co.	300,568	304,111	3,543	1.2	334,335	339,399	5,064	1.5
Regional Total	2,261,076	2,261,094	18	0.0	1,787,014	1,787,138	124	0.0
Study Area	576,335	583,044	6,709	1.2	360,603	368,218	7,615	2.1

Figure 1.3-13 shows the projected household pattern in the region. The number of households is forecast to increase within the UGA compared to the No Action Alternative, but there also could be more growth at the outer edges of the UGA.

The forecast growth pattern under Alternative 4, when compared to the No Action Alternative, suggests a different trend for pressure to occur outside of the UGA, which also could result in increased growth pressure on the fringe areas of the UGA not currently planned for higher urban densities. This would be considered a negative impact on land use outside of the UGA and is not supported by *Destination 2030* or the CWPP.

Alternative 4 would perform similar to Alternative 3 with regard to addressing the long-term concurrency problems facing local jurisdictions. The capacity expansions on I-405 included in Alternative 4 would shift traffic onto I-405 from the arterials and reduce study area traffic congestion. This would improve opportunities relative to Alternatives 1 and 2 for clustering of development and increasing density within the urban centers and the UGA without triggering limitations under concurrency ordinances.



Legend: Cumulative Effects (Change in Employment for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- 249 to -51
- 50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

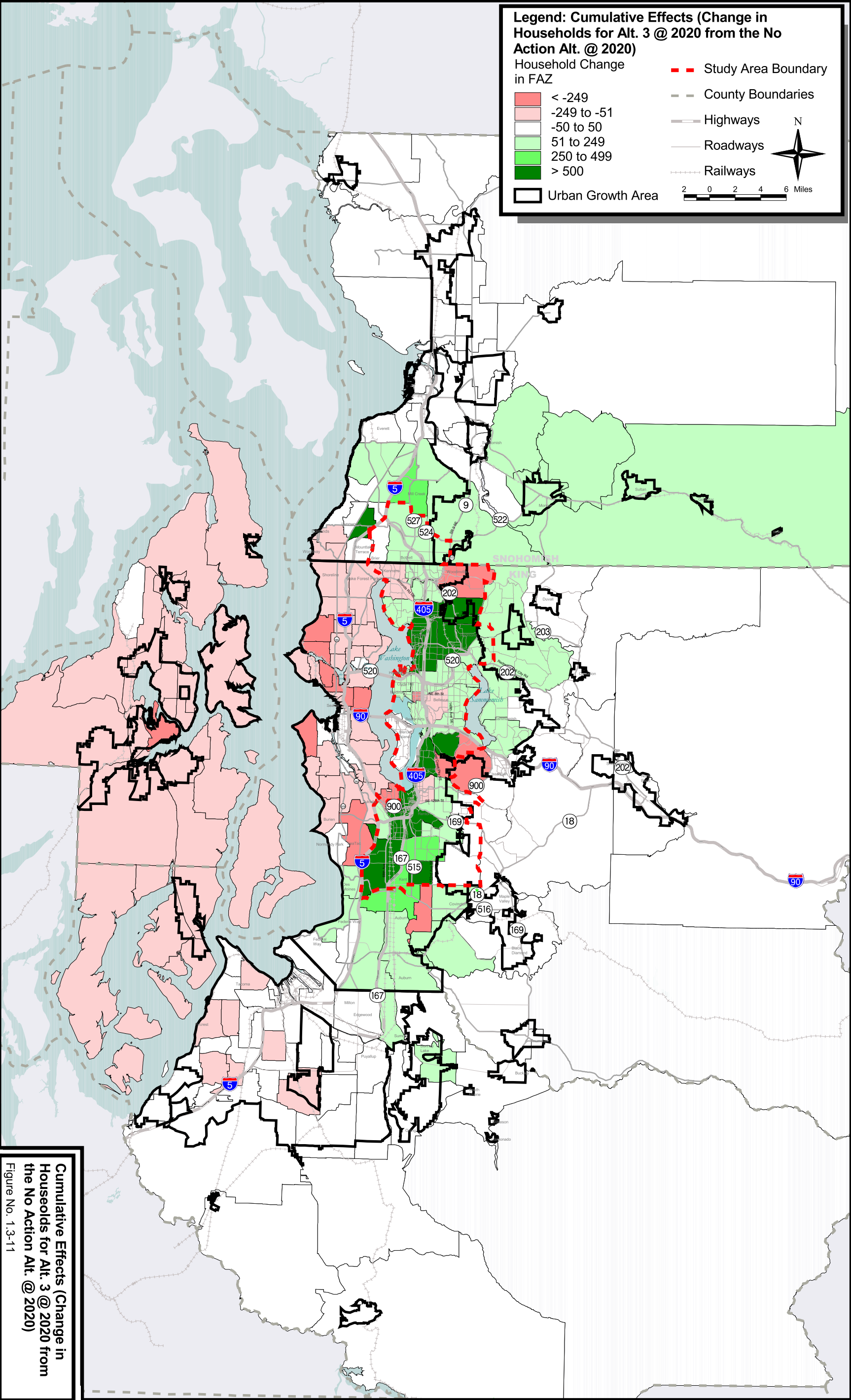
2 0 2 4 6 Miles

N

Cumulative Effects (Change in Employment for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-10

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Cumulative Effects (Change in Households for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

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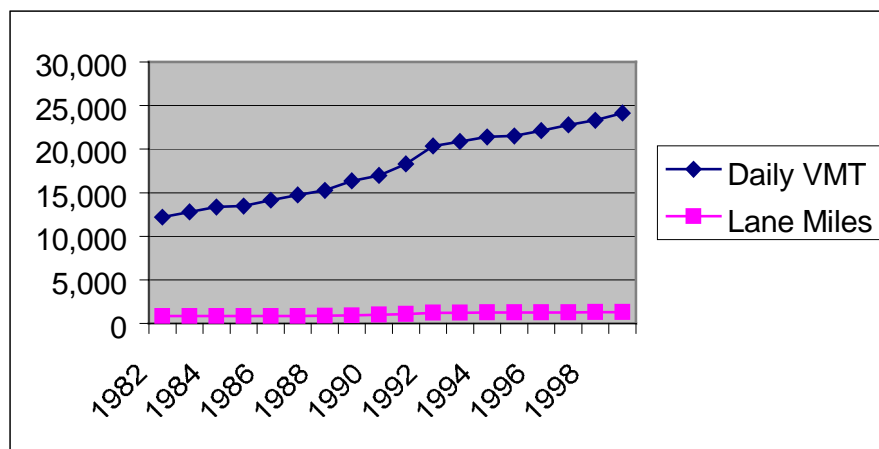
1.3.6 Traffic and Transportation

Roadway Network

The I-405 corridor is one of many transportation corridors within the regional network of roadways connecting communities throughout the Puget Sound. The four-county region has more than 11,400 lane miles. The I-405 corridor study area has about 13 percent of the region's roadways. Because of the relatively sparse roadway network in the I-405 study area (about 1,500 lane-miles in the 250-square-mile area), there is greater reliance on state highways to serve non-regional trips than would normally be the case. Interstate 405 is the transportation backbone of the study area, and travel demand within the study area is heaviest on I-405 itself.

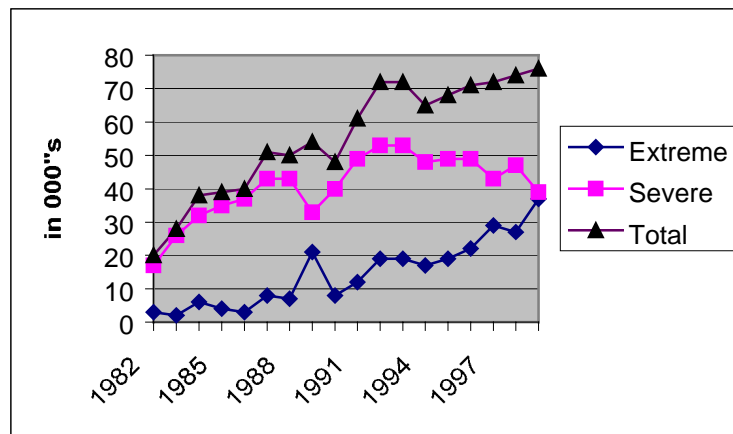
Figure 1.3-14 shows the growth of freeway lane miles and daily VMT in the region over the past 20 years. Figure 1.3-15 shows the result, increasing percentage of lanes with peak period congestion. Extreme congestion continues to increase each year, as the freeways have become more crowded during the peak hours.

Figure 1.3-14: Growth in Freeway Region-wide Daily VMT (000's) and Freeway Lane Miles 1982-2000



Source: Texas Institute Mobility Data for Seattle-Everett, 2001 Urban Mobility Study

Figure 1.3-15: Percent of Peak Period Travel in Severe or Extreme Congestion (1982-2000)



Source: Texas Institute Mobility Data for Seattle-Everett, 2001 Urban Mobility Study

Traffic Volumes and Travel Demand

In evaluating the regional cumulative effects of the I-405 Corridor Program, the forecasts for population, employment, and travel demand in the corridor were compared to forecasts for the four-county central Puget Sound region. Several observations were made. As the Eastside has grown, traffic volumes have increased dramatically. From 1970 to 1999, the average daily traffic on I-405 north of I-90 increased nearly five-fold, growing from 41,000 to 198,000 cars per day. The roadway network has not expanded at the same rate, resulting in increased congestion on all the roads, especially on the I-405 freeway.

While the entire corridor experienced almost a 400 percent increase in traffic volumes from 1970-1999, various sections of I-405 show different rates of traffic growth. From 1980 to 2000, the increase in the corridor was 150 percent, as capacity was reached on several sections of I-405. Table 1.3-7 presents a historical summary of the average annual daily traffic on selected arterials and state roads in the I-405 Corridor Program study area.

Table 1.3-7: Average Annual Daily Traffic on Selected Arterial and State Roads in I-405 Study Area (1965 to 1999)

Measurement Location	1965	1970	1975	1980	1985	1990	1995 baseline	1999
I-405 north of I-90	24,400a	41,000a	53,400a	80,100a	115,400a	137,600c	164,832	198,000c
I-405 north of SR 520	12,100a	33,400a	48,400a	76,400a	107,400a	146,800c	152,174	178,000c
I-405 north of SR 522	N/A	15,000a	20,300a	37,200a	52,700a	88,400c	92,822	94,000c
I-405 south of I-90	24,000	N/A	N/A	76,000c	115,400c	129,000	116,525	168,000c
SR 522 west of I-405	N/A	N/A	N/A	21,500c	24,800c	30,000	32,000c	38,000c
SR 908 east of I-405 (Rose Hill)	N/A	N/A	N/A	24,800c	28,300c	30,000	31,000c	46,300d
148 th Ave SE north I-90	N/A	15,000a	18,400a	22,600a	30,200a	N/A	N/A	39,700e
Lake Wa Blvd north of SR 520	2,200a	11,800a	11,700a	23,000a	27,500a	N/A	N/A	N/A
I-90 Mercer Island Bridge	17,900 b 42,892a	48,352a	48,655a	52,283a	68,500a	112,400c	128,000c	121,000c
SR 520 Lake Wash. Bridge	22,998a	37,744a	47,544a	72,130a	99,500a	97,700c	100,000c	110,000c

a Eastside Transportation Program, Background Report, October 1988, p. 4.

b Number of vehicles in 1961, Puget Sound Regional Transportation Study

c WSDOT Annual Traffic Report, 1983, 1985, 1991, 1994, 1996

d City of Kirkland, 1999 traffic counts

e City of Bellevue, 2000 traffic counts

The forecasts for VMT and VHT in the study area are expected to follow the region's forecasted trend of a greater than 50 percent increase between 1999 and 2020. Table 1.3-8 presents the historical growth in VMT and VHT for the I-405 study area from 1980 to 2000, including the 2020 No Action Alternative, and the growth for the four-county region during the same time period.

Table 1.3-8: VMT and VHT for Study Area and Region

Alternative	VMT (Daily)		VHT (Daily)	
	Study Area (trips within)	Region-wide	Study Area (trips within)	Region-wide
1980	9,322,000	39,500,000	359,800	1,411,000
1990	14,962,400	63,400,000	529,100	2,075,000
1995	16,346,000	69,412,000	586,000	2,295,000
2020 No Action Alternative	22,510,000	100,571,000	1,156,000	3,948,000
Change vs. 1995 (%)	37.7%	44.9%	97.3%	72.0%
Alternative 1	22,563,000	100,497,000	1,155,000	3,941,000
Change vs. No Action Alternative (%)	0.2%	-0.1%	-0.1%	-0.2%
Change vs. 1995	38.0%	44.7%	97.2%	71.7%
Alternative 2	24,215,000	101,560,000	1,164,000	3,922,000
Change vs. No Action Alternative (%)	7.6%	1.0%	0.7%	-0.7%
Change vs. 1995	48.1%	46.3%	98.6%	70.9%
Alternative 3	25,346,000	102,263,000	1,170,000	3,907,000
Change vs. No Action Alternative (%)	12.6%	1.7%	1.2%	-1.0%
Change vs. 1995	55.0%	47.3%	99.7%	70.2%
Alternative 4	26,208,000	102,730,000	1,184,000	3,903,000
Change vs. No Action Alternative (%)	16.4%	2.1%	2.4%	-1.14%
Change vs. 1995	60.3%	48.9%	102.0%	70.1%

Source: PSRC Model

Without accounting for the potential effects of TDM, VMT in the study area is expected to increase under each alternative. Alternatives 3 and 4 show the largest increases in the study area VMT (13 percent and 16 percent, respectively). Regional VMT increases by 1 to 2 percent for Alternatives 2 through 4, while Alternative 1 reduces regional VMT slightly. When the TDM program is included in the action alternatives, study area VMT could be reduced for each of the action alternatives by 5 percent or more.

Study area VHT decreases slightly with Alternative 1 (not including TDM effects). Alternatives 2, 3, and 4 result in increases in VHT because of the additional travel within the corridor. However, regional VHT decreases with each alternative, up to slightly more than 1 percent under Alternative 4. The effects are most pronounced during the PM peak period. The TDM program could further reduce study area VHT for each of the action alternatives.

Trips in the study area are forecasted to increase by 50 percent between 1999 and 2020, similar to the regional increase. For the year 2020, the trip pattern percentages in the region are expected to be similar to those currently in the region. In the I-405 Corridor Program study area, the relative shares of each trip purpose are expected to be similar in 2020 to those currently in the corridor. Trip distribution, i.e., where trips are going to and coming from in relation to the study area, are also forecasted to change very little by year 2020 in the I-405 corridor. More than 55 percent of daily trips begin and end within the study area, with the remaining 45 percent of trips beginning or ending outside the study area. Over 70 percent of the total daily person-trips are less than 10 miles within the study area; less than 10 percent of the trips are over 30 miles in length. These trip patterns are expected to continue in the corridor in the year 2020, although there could be a slightly higher percentage of trips averaging over 30 miles in length.

Performance of I-405 Corridor Program Improvements in the Region

As previously discussed, the I-405 Corridor Program study area includes 21 percent of the regional population, and produces about 24 percent of the region's trips. This percentage has held relatively constant for the past 30 years and is forecasted to continue for the next 30 years given the current plans and policies in the region. As part of the second level screening for the four action alternatives, the travel demand model was used to examine the effects of improvements by forecasting performance measures such as transit ridership, highway congestion, traffic volumes, and mode share shifts on I-405 and the study area. The transportation performance measures for the region in *Destination 2030* include the cumulative effects of the more prominent transportation improvements proposed in the I-405 Corridor Program, as noted above. Table 1.3-9 provides a comparison of performance measures.

Table 1.3-9: Performance Measures for Destination 2030 (Regional) and I-405 Study Area

	Destination 2030 (MTP)	1995 Baseline	2020 No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VTM (daily total) Region-wide	93,562,322						
VTM (daily total) Study area		16,346,000	22,510,000	22,563,000	24,215,000	25,346,000	26,208,000
VHT (daily) Region-wide	3,226,300						
VHT (daily) Study area		586,000	1,156,000	1,155,000	1,164,000	1,170,000	1,184,000
Mode Share - all trips (weekday)							
SOV	55%	99%	96.00%	96.00%	96.00%	96.00%	96.00%
2+ Carpool	39%	Included above	Included above	Included above	Included above	Included above	Included above
3+ Carpool		1%	2%	2%	2%	2%	2%
Transit	5%	1%	2%	2%	2%	3%	2%
Mode Share - commute							
SOV	56%	95%	84%	83%	83%	83%	83%
2+ Carpool	32%	Included above	Included above	Included above	Included above	Included above	Included above
3+ Carpool	Included above	2%	9%	9%	9%	9%	9%
Transit	12%	3%	7%	8%	8%	8%	8%
Average Speeds in MPH							
AM Peak	35	30	26	26	27	28	29
PM Peak	32	24	13	13	13	14	14
Daily	34	28	19	20	21	22	22

Source: Destination 2030 (MTP):

Destination 2030 adopted May 24, 2001 (Metropolitan Transportation Plan for the Central Puget Sound Region); Technical Appendix 8: Destination 2030 System Performance.

For all other columns including - the 1995 Baseline, 2020 No Action Alternative, and the four Alternatives -- the source is the *I-405 Corridor Program Draft Transportation Expertise Report* (Mirai and DEA, 2001), February 2001.

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